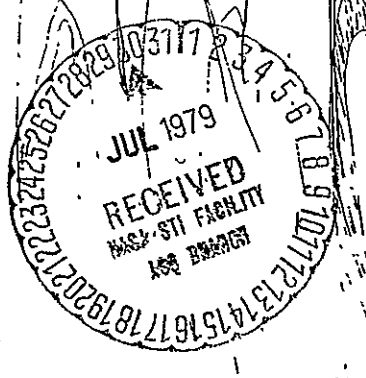
STATE-REGIONAL FUTURE

Great Lakes Region

1975 National Water Assessment

July 1976



Great Lakes Basin Commission

STATE-REGIONAL FUTURE

Great Lakes Region

1975 National Water Assessment

July 1976

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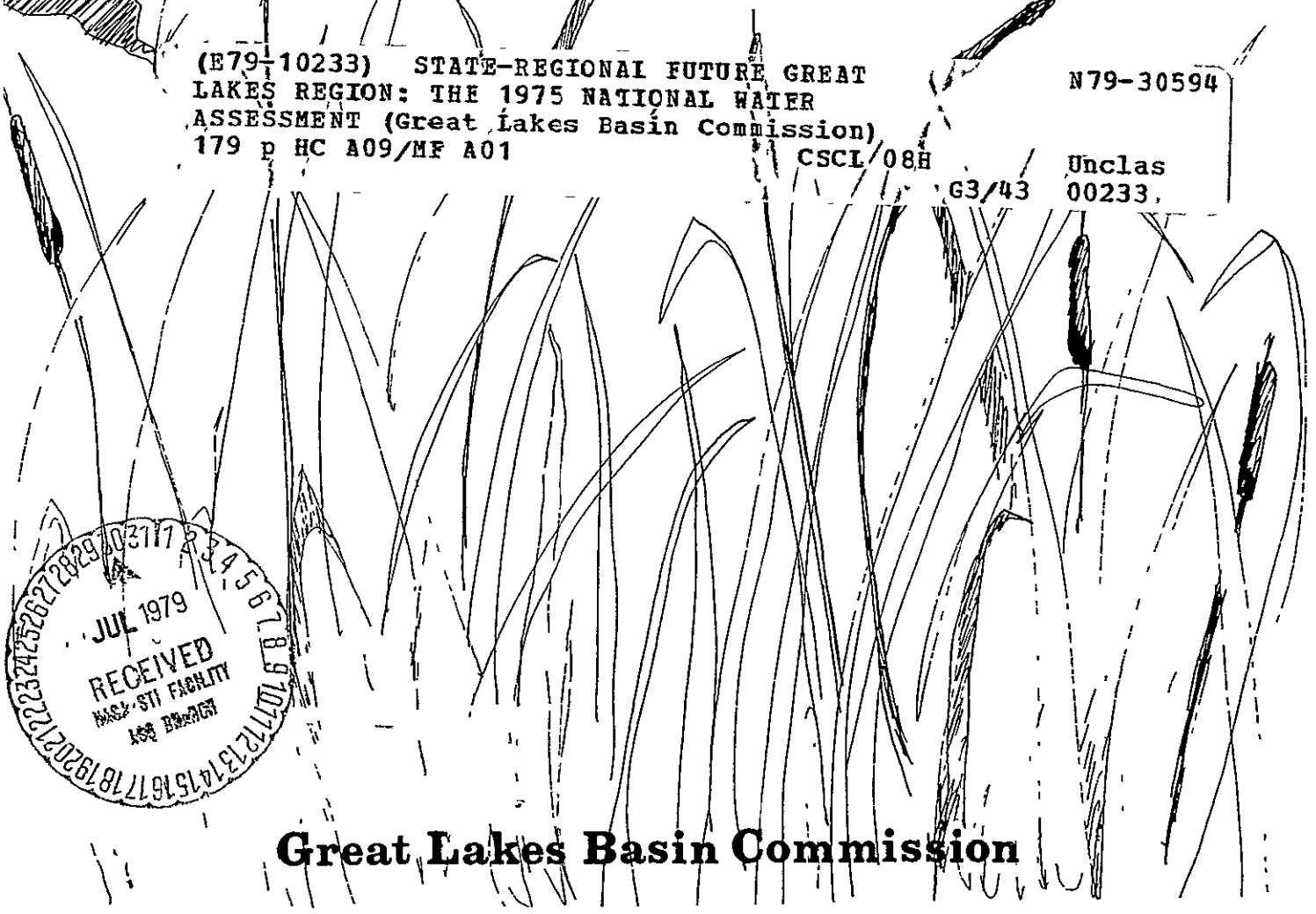

Great Lakes Basin Commission

STATE-REGIONAL FUTURE

GREAT LAKES REGION

1975 National Water Assessment

Great Lakes Basin Commission

July 1976

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INTRODUCTION

The purpose of the Great Lakes Basin Commission's participation in the 1975 National Water Assessment is to articulate the State and regional viewpoints concerning water-related problems. With the assistance of the Great Lakes National Assessment Work Group, composed of representatives of the Commission's member agencies, and a Public Review Group, the Great Lakes Basin Commission staff has been gathering information on the critical resource issues in this region. The first major activity involved the identification and description of the severity of problems and the economic, environmental, and social effects of not resolving them. Information from published reports, the Work Group, and the Public Review Group was assembled last summer and will be worked into a final format later this spring.

The objective of this report is to take a look at the future for the Great Lakes Region and assess the direction and degree of projected developments. Through explicitly stated assumptions, requirements for water and related land land resources can be estimated with some degree of confidence These projections form the basis for problem evaluations covering a not too certain future. This lack of certainty dictates that the role of projections be recognized as only a benchmark from which to make decisions concerning future needs. The fact that the Assessment is being developed into a continuous process is an acknowledgement of constantly changing perceptions. Also, by using the Assessment in tandem with the Framework Study, projections which cover a reasonable range of future conditions can be examined.

Although this report contains projections of future needs and issues, there are many ongoing programs which will influence the course of future activities in the natural resources field. The full impact of these programs will not be realized for some time, but their existence and intent is an important consideration in resources planning. Programs such as 208 wastewater management planning, coastal zone management, and various land use programs are examples of major developments which should be closely monitored. The GLBC publishes an annual programs listing which describes ongoing and anticipated water and related land programs in the Great Lakes Basin.

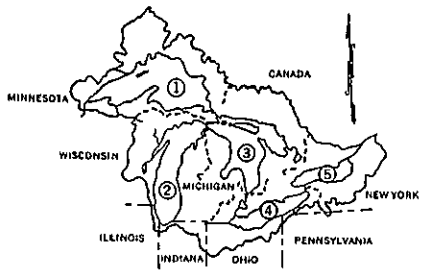
The sections that follow cover Regional goals and objectives, socio-economic characteristics, natural resource values, and water and related land requirements. The information is organized by Aggregated Subareas (ASAs) and, at times, along State lines Because the delineation of regional boundaries is somewhat different than that used in the Framework Study, the following explanation and maps should prove a useful guide to the rest of the report.

National Assessment ASA Number	Framework Study Subarea(s)
01 - Lake Superior	1.1 and 1.2
02 - Northwest Lake Michigan	2.1 plus Delta County
03 - Southwest Lake Michigan	2.2
04 - Eastern Lake Michigan	2 3 and 2.4 minus Delta County
05 - Lake Huron	3.1 and 3.2
06 - Western Lake Erie	4.1 and 4 2
07 - Eastern Lake Erie	4.3 and 4.4
08 - Lake Ontario-St. Lawrence	5 1 and 5.2 and 5.3 minus Herkimer and Oneida Counties; plus Franklin County.

1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

LAKE SUPERIOR



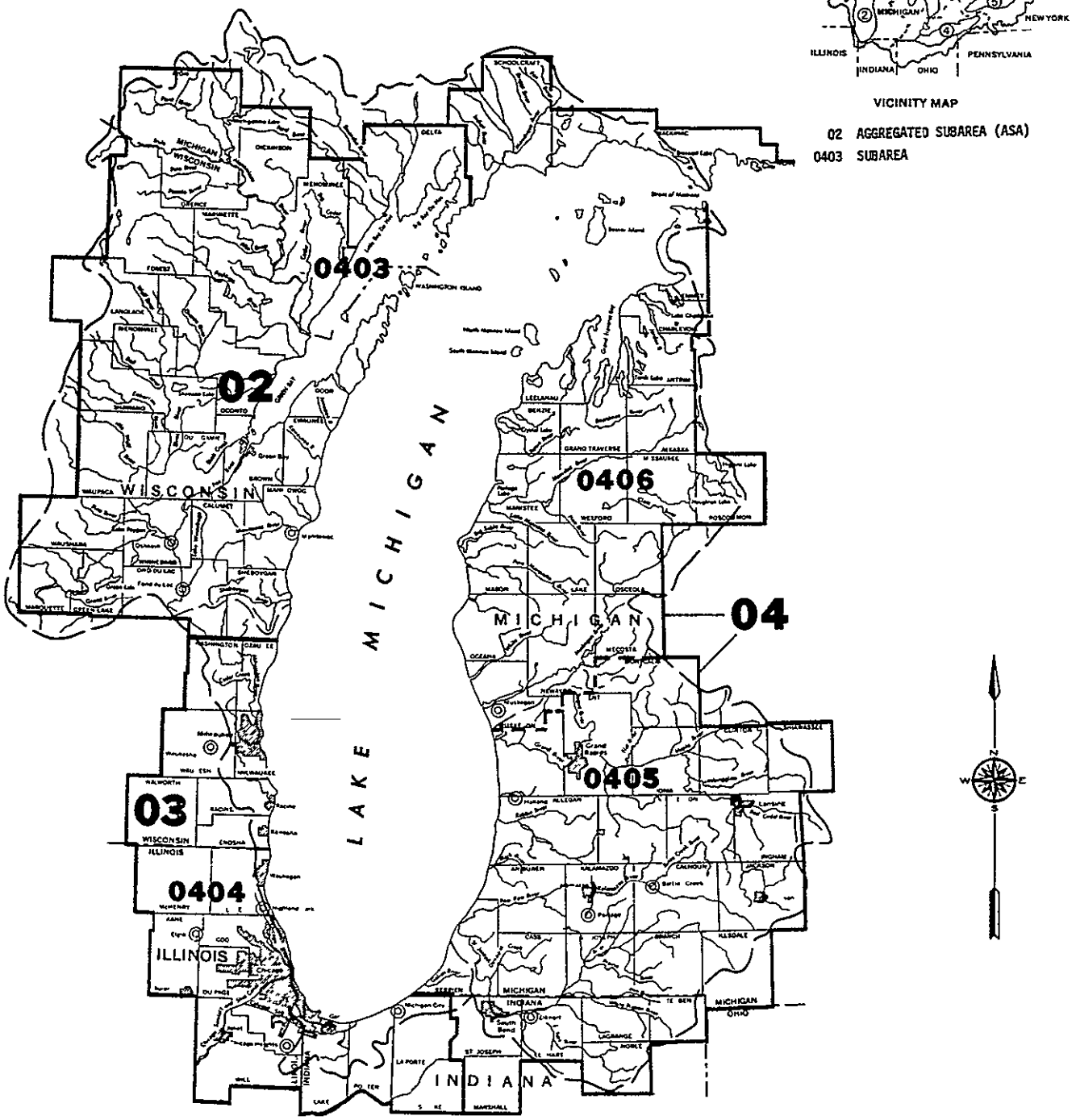
VICINITY MAP

01 AGGREGATED SUBAREA (ASA)

0401 SUBAREA

SCALE IN MILES

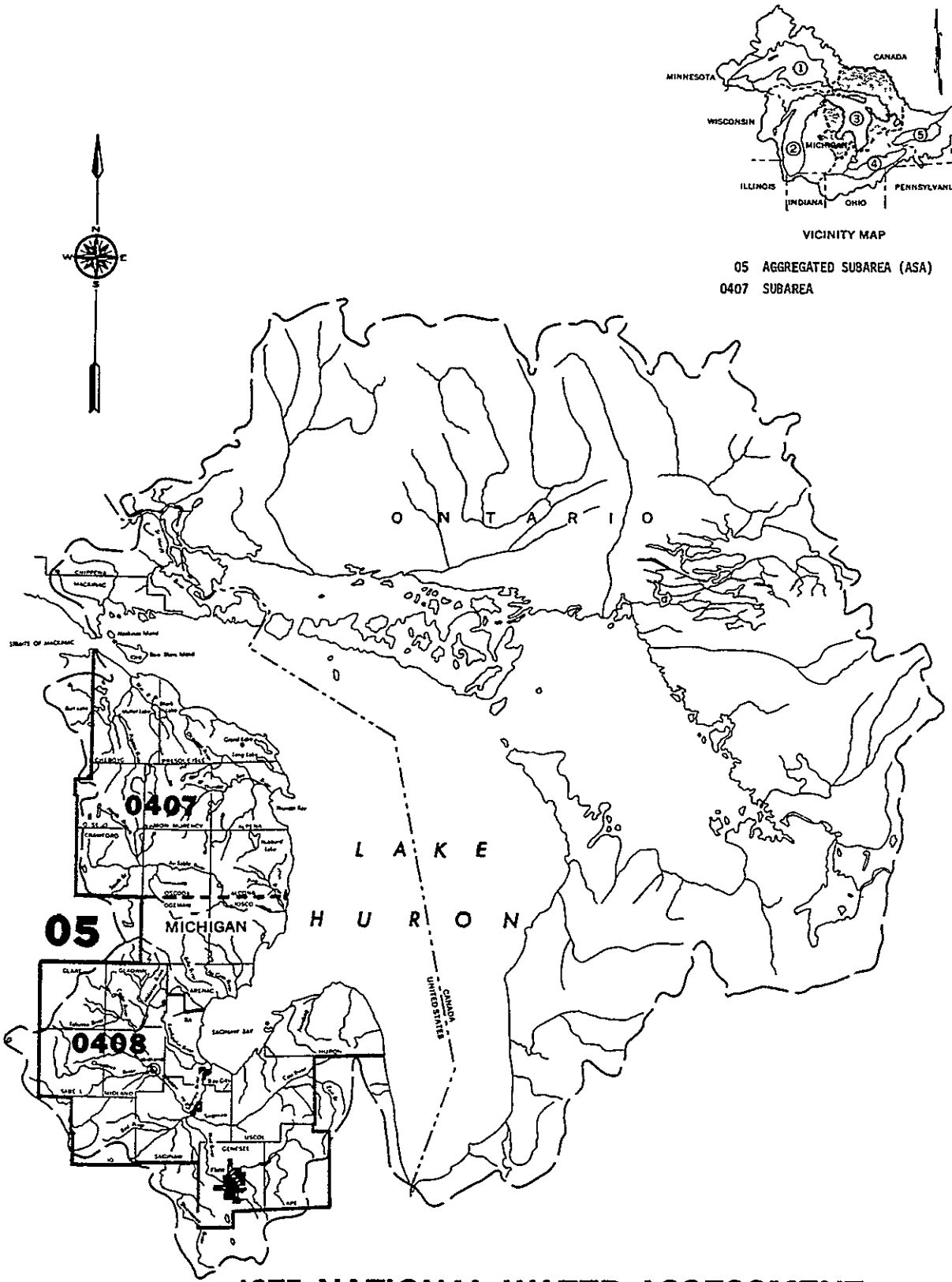
0 10 20 30 40 50



1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

LAKE MICHIGAN



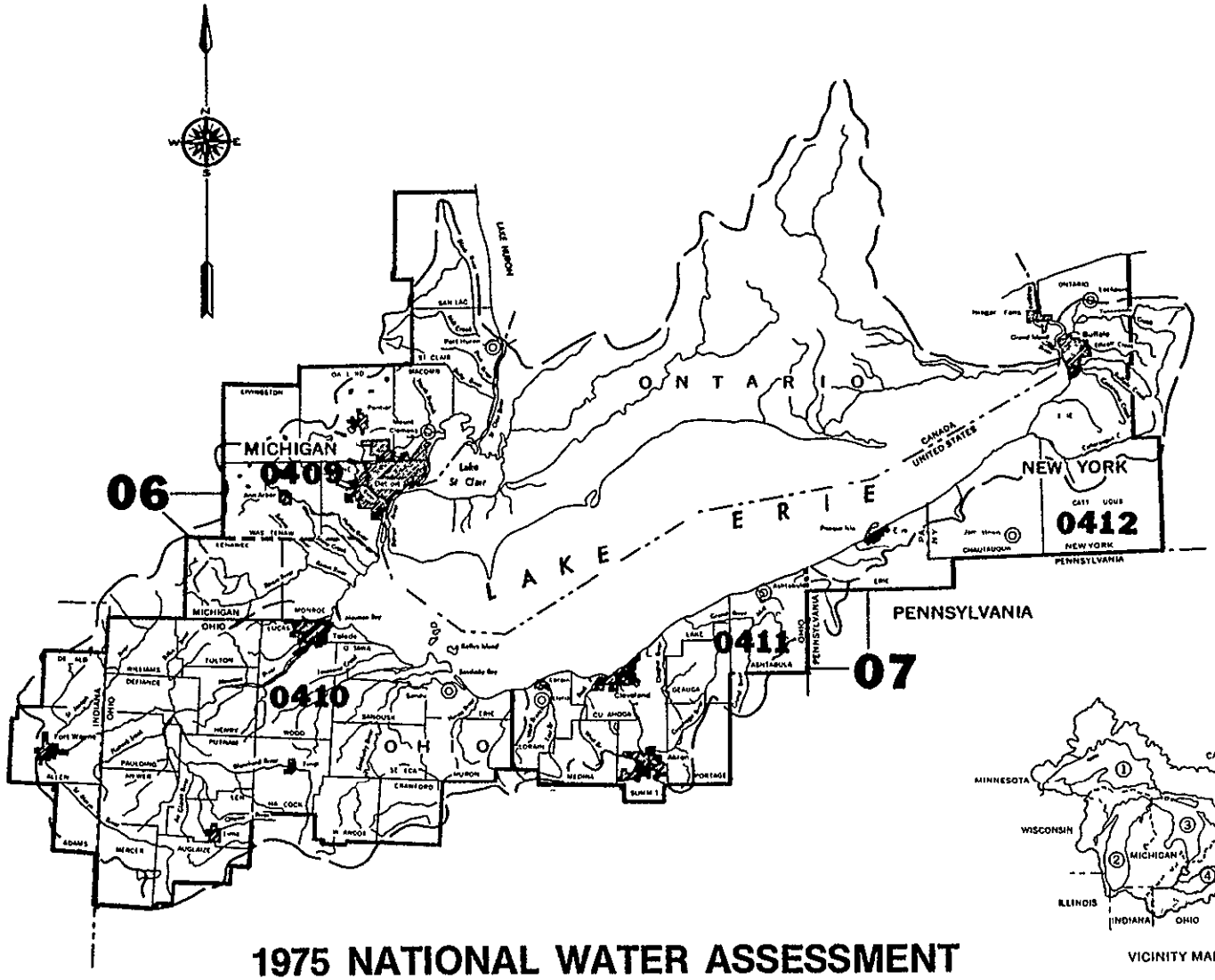
1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

LAKE HURON

SCALE IN MILES

0 10 20 30 40 50



1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

LAKE ERIE

VICINITY MAP

06 AGGREGATED SUBAREA (ASA)
0409 SUBAREA

SCALE IN MILES
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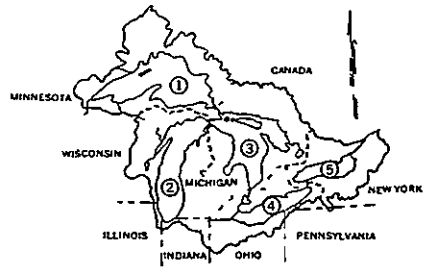
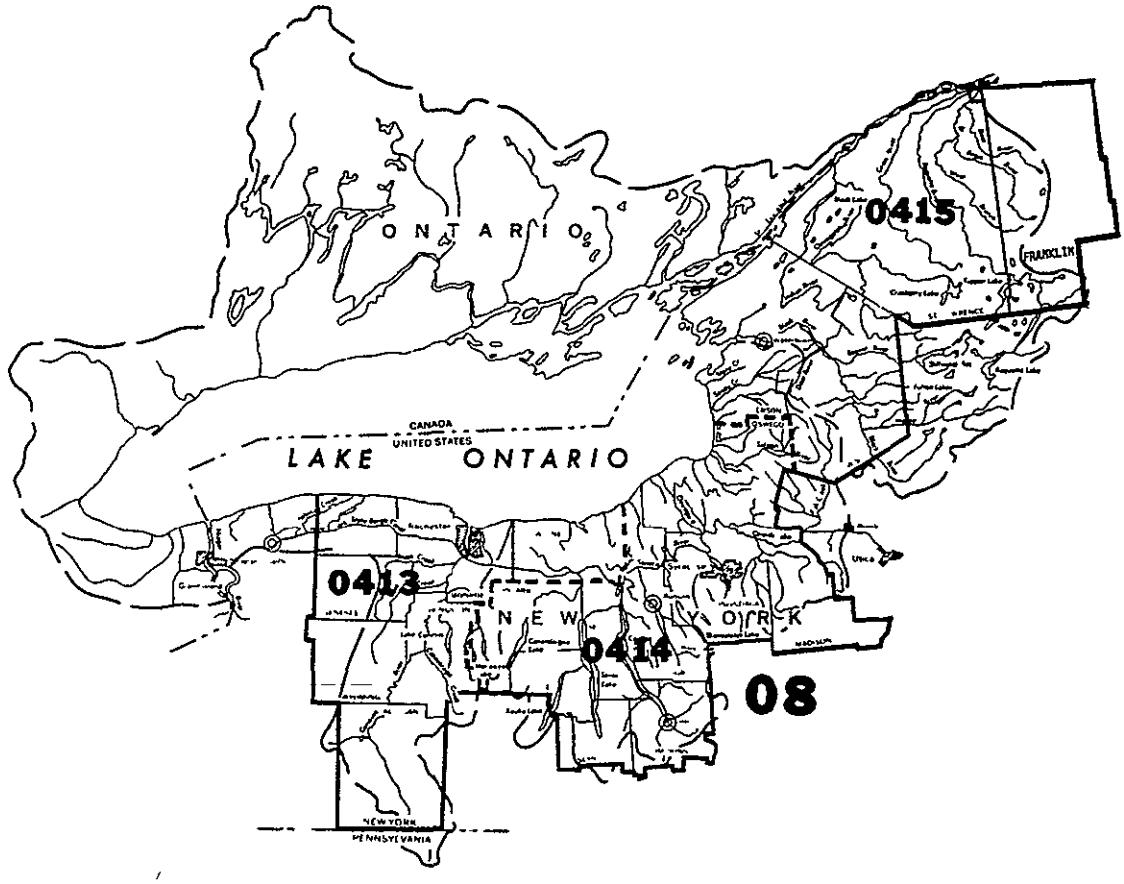


VICINITY MAP

08 AGGREGATED SUBAREA (ASA)
0413 SUBAREA



1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

LAKE ONTARIO

SCALE IN MILES
0 10 20 30 40 50

REGIONAL GOALS

In defining a state-regional future condition, a logical starting point is an indication of the values that society holds expressed in terms of broad economic, social, and environmental goals. Extrapolation of past trends into the future does not always reflect a reasonable or desirable outlook for the future. Our institutions have the ability and, at times, the will to change the course of future developments. Water and related land resource planning is one vehicle for obtaining the desired ends that society values. It is a most difficult task, however, to determine what those values are and translate them into broad goals to guide the decisions which will have an impact on our natural resources and environment.

To begin the process, the Great Lakes Basin Commission asked its State members to submit broad statements of social, economic, and environmental goals to which the citizens of their State aspire. Some of these statements appeared in the draft State-Regional Future report and were subject to comments by the Public Review Group. The remaining States submitted their goals at a later date, these statements were also used in formulating regional goals.

Based on State goals and comments from the Public Review Group and the National Assessment Work Group, the Great Lakes Basin Commission staff made an initial attempt at specifying regional goals These goals are arranged according to lake basin and categories of water and related land issues Goals from each State were screened and those which were not in conflict with the goals of other States in the particular region were included. The goals for a particular lake basin may not be specifically stated in each State's goals and objectives, but the intent and purpose of the statements should be consistent with the States' policies and goals.

Regional goals give an indication of the direction in which the Great Lakes States are moving. Conflicts between these aspirations and current trends indicate areas that demand attention in natural resources planning. These regional goals will be of much value to other Great Lakes Basin Commission activities, particularly in the development of a comprehensive coordinated joint plan (CCJP) and the establishment of priorities for water and related land programs and projects.

LAKE SUPERIOR REGIONAL GOALS

POPULATION AND ECONOMIC ACTIVITY

- Promote economic expansion while discouraging ecologically unsound aspects of population, economic, and technological growth, and developing and implementing policies such that growth occurs only in an environmentally acceptable manner.

- Create conditions that will encourage expansion of employment-generating industries such as manufacturing, tourism, and the resource industries of agriculture-forestry-fishing, and mining.

- Provide adequate facilities and programs for vocational-technical education and manpower training in needed skills.

- Restore and maintain the quality of the environment and other living inducements.

ENVIRONMENTAL PROTECTION

- Preserve sufficient wild land areas and scientific areas to provide representative examples of all types of geological features and terrestrial and aquatic communities native to the Lake Superior region, insuring not only their preservation for the future, but also their availability for research and educational use at all levels of instruction.

- Identify areas of critical concern, areas of the basin possessing important historic, cultural, or aesthetic values, or natural systems which perform functions of greater than local significance; States should assist and cooperate with local units of government in the preparation of plans and regulations for the wise use of these areas.

- Preserve and protect certain rivers and their adjacent lands possessing outstanding scenic, recreational, natural, historical, scientific, and similar values.

AGRICULTURAL PRODUCTION

- Insure adequate supplies of high quality food and fiber for a growing population at reasonable prices to consumers.

- Develop an agriculture that will (a) return to farmers comparable incomes to what their resources and talents would pay them in other occupations and (b) strengthen individually owned farm operations.

- Protect the quality of our environment from pollution from agricultural wastes and chemicals used in food and fiber production.

- Conserve and develop natural resources used in agriculture: land, soil, energy, minerals, water.

- Describe, identify, and delineate prime agricultural lands and undertake measures to protect and preserve them

- Manage productive agricultural lands to their fullest potential and with as little environmental damage as possible.

- Permit a very limited conversion of marginal farmland to low density non-farm residential development where the soils and topography can safely support private on-site sewerage and water systems on existing year-round maintained roads.

- Maintain and enhance the long-term productive potential of essential agricultural lands through sound management and protection from damaging development.

FORESTRY

- Maintain and enhance the long-term productive potential of essential forest lands through sound management and protection from damaging or premature development.

- Provide management, services, and protection to improve productivity of the Lake Superior region's forest land to increase the sustained yield flow of forest products now and in the future to the wood-using industrial complex to assure a continuing growth of this manufacturing industry to the economy of the region and to provide multiple use benefits of a varied nature to meet the recreational demands and needs of the people of the region.

- Manage the forest resources to provide for hydrologic and water quality benefits, especially for retarding runoff, facilitating infiltration, and controlling erosion and sediment.

LAND RESOURCES

- Develop institutional arrangements and vehicles for intergovernmental cooperation between local governmental implementing authorities on an interstate basis to facilitate land use planning and waste disposal regulation and to solve the basinwide red clay erosion and sediment problems.

- Initiate and implement an action program for soil erosion and sediment control in the Lake Superior Basin which will lead into a basinwide program, including implementation of an initial work and survey program as recommended in the 1972 Red Clay Interagency Report, "Erosion and Sedimentation in the Lake Superior Basin," and the "Nemadji River Prospectus."

- Provide for the conservation of the soil and soil resources of the Lake Superior region and for the control and prevention of soil erosion, for land resource planning and development, for the implementation of land resource use practices that effectively reduce siltation and loss of the land through activities associated with farming, mining, construction, forestry, and other activities of man.

- Protect the Lake Superior region's soil resources to assure their continued availability for all beneficial uses by preventing adverse land uses and reducing off-site damage due to winds and water-carried soil material.

- Give an especially high priority to the protection of soils with a high potential for agricultural crop production.

- Control building and construction activities to minimize soil loss during the periods when soil is exposed

- Adopt and enforce land use practices which will minimize soil degradation and off-site damages.

- Complete soil surveys in special hazard areas such as those that are highly erodable or subject to landslides.

- Reforest erosive marginal open crop and pasture land.

- Demonstrate and evaluate new or innovative techniques for controlling or preventing sedimentation.

DRAINAGE AND WETLAND PROTECTION

- Identify and evaluate unique water-oriented natural environments such as wetlands, bogs, estuary areas, and determine the relative value of these resources so that the most valuable can be preserved or protected on a priority basis.

- Carefully assess all drainage proposals as to their environmental impact.

SHORELAND AND FLOOD PLAIN MANAGEMENT

- Regulate development of flood plains in order to protect human life and health, minimize expenditures of public monies for costly flood control projects, repair of damaged public facilities in the flood plain, and rescue and relief efforts; minimize business interruptions; maintain a stable tax base; and discourage victimization of unwary land and home buyers.

- Prohibit, where appropriate, flood plain development in urban and rural areas.

- Reduce flood damages through flood plain management, stressing nonstructural measures such as flood plain zoning, flood proofing, and flood warning practices.

- Provide State coordination and assistance to local governmental units in flood plain management and encourage local governmental units to adopt, enforce, and administer sound flood plain management ordinances.

- Complete soil surveys in special hazard areas or areas with physical limitations for development such as flood plains.

- Maintain existing high quality conditions through more careful management of on-site waste disposal systems and the utilization of common septic tank systems located away from lakes. Retain vegetative cover strips along shorelines

- Provide guidance for the wise development of shorelands of public waters and thus preserve and enhance the quality of surface waters, preserve the economic and natural environmental values of shorelands, and provide for the wise utilization of water and related land resources of the region.

- Avoid extremes in the Lake Superior levels to prevent excessive shoreline erosion and damage to coastal ecosystems.

Lake Superior; Interstate Streams and Their Tributaries

• . . .St. Louis River, St. Louis Bay, Superior Bay and Lake Superior, joint resolution, Minnesota and Wisconsin. "Resolved, to follow the established programs for the improvement of the quality of said interstate waters and their tributary streams whereby each state shall require the effective prevention or correction of pollution originating within that state as provided by the laws of such state to the end that said waters and their tributaries may be maintained or rendered suitable for appropriate public uses. . ." (Wisconsin Department of Natural Resources; Administrative Code-Chapter NR 106 on Interstate Joint Resolutions, NR106.01, This code is a policy pursuant to interstate agreements ratified by the states mentioned in the statement.)

• Interstate waters should meet requirements for recreational use and fish and aquatic life. Interstate waters including Lake Superior are named in the Wisconsin Administrative Code, Section NR 103.02 and NR 103.05.

Other Water Quality Objectives

• Reduce the deleterious impact on air and water quality from all sources. . . (Minnesota Environmental Protection Act 1973, Section 2, Subd. 2)

• Encourage advanced waste treatment in abating water pollution (Minnesota Environmental Protection Act 1973, Sec. 2, Subd 2)

• Provide for the prevention, control, and abatement of pollution of all waters of the state, so far as feasible and practical, in furtherance of conservation of such waters and protection of the public health and in furtherance of the development of the economic welfare of the state, safeguard the waters of the state from pollution by: preventing any new pollution, and abating pollution existing when laws 1963 Chapter 874, became effective. (Minnesota Statutes, Chapter 115, Sec. 115 42)

• To encourage waste treatment including advanced waste treatment, instead of stream low-flow augmentation for dilution purposes to control and prevent pollution. (Minnesota Statutes, Chapter 105, Sec. 105.03, Subd. 1)

• . .It is the policy of this state to restore and maintain the chemical, physical, and biological integrity of its waters to protect public health, safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, agricultural, and other uses of water. In order to achieve this policy, the legislature declares that:

(a) It is the goal of the State of Wisconsin to eliminate the discharge of pollutants into the waters of the State by 1985;

(b) It is also the goal of the State of Wisconsin that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by 1983;

(c) It is also the policy of the State of Wisconsin that the discharge of toxic pollutants in toxic amounts be prohibited.

(Wisconsin Department of Natural Resources, Chapter 147 on Pollution Discharge Elimination, 147.01)

- Because of the importance of Lakes Superior and Michigan and Green Bay as vast water resource reservoirs, water quality standards for those rivers emptying into Lakes Superior and Michigan and Green Bay shall be as high as is practicable. (Wisconsin Dept. of Natural Resources, Chapter 144 on Water, Ice, Sewage, and Refuse; 144.025)

FISH AND WILDLIFE

- Preserve important existing natural habitats of rare and endangered species of plants, wildlife, and fish, and provide for the wise use of our remaining areas of natural habitation, including necessary protective measures where appropriate.

- Manage and protect the public waters of the Lake Superior basin to insure the highest value of the fisheries produced.

- Develop and maintain fish populations in the Lake Superior basin waters that are capable of producing sport fishing.

- Protect, develop, maintain, and restore where feasible the basin's wildlife resources to provide optimum hunting and nonhunting recreational values and other social values and to perpetuate ecosystems necessary for public welfare.

- Protect and maintain through efficient management optimum populations of all wild birds and animals for the numerous recreational, ecological, and economic benefits they afford people.

OUTDOOR RECREATION

- Make available for the use of the public open spaces for recreation or for the preservation of natural beauty or natural features possessing historic information or association.

- Regulate the use of recreation areas to preserve the scenery, the natural and historic features, and the wildlife found thereon and to provide for the enjoyment of these features and aspects by the public in such a way as to assure preservation for the enjoyment of future generations.

- Implement policy and program changes and projects which will contribute to the solution of escalating conflicts and correction of major outdoor recreation opportunity conflicts.

- Encourage and promote the use of privately owned lands and waters by the public for beneficial recreational purposes.

- Give high priority to the provision of adequate recreation facilities and environmental improvements in and near metropolitan areas.

- Control development of private lands within public forest boundaries, especially along surface waters and roads.

- Expand small boat harbor developments.

WATER SUPPLY

- Conserve and utilize the water resources of the basin in the best interests of the people of the basin and for the purpose of promoting public health, safety, and welfare.

- Insure that water resource supply is as adequate as possible to meet present and anticipated demand.

- Encourage new seasonal and especially year-round residential development to locate within urbanized areas that have established utilities and other essential urban services

- Develop and manage water resources to assure a supply adequate to meet long range seasonal requirements for domestic, municipal, industrial, agricultural, fish and wildlife, recreational, power navigation, and quality control purposes from surface or ground water sources or from a combination of these.

MINING

- Insure adequate and continuing supplies of minerals for a growing population at reasonable prices to consumers and consistent with environmental goals.

- Provide that the air, lands, waters, fish and wildlife affected by prospecting or mining will receive the greatest practicable degree of protection and reclamation.

- Minimize wasteful and unnecessary depletion of nonrenewable resources.

- Maintain and enhance the long-term productive potential of essential mineral-bearing lands through sound management and protection from damaging or premature development

ENERGY

- Insure that an adequate and reliable supply of energy is available for the future populace of the Lake Superior region consistent with environmental objectives and standards.

- Achieve a high degree of planning and coordination between energy resource programs and natural resource management programs to minimize adverse environmental effects.

- Encourage thrift in the use of energy and maximize use of energy-efficient systems, thereby reducing the rate of growth of energy consumption, prudently conserving energy resources, and assuring regionwide environmental protection consistent with an adequate, reliable supply of energy.

COMMERCIAL NAVIGATION

- Encourage ecologically sound maintenance dredging.

- Approach expansion of navigation cautiously, with environmental and recreational interests taken into consideration.

LAKE MICHIGAN REGIONAL GOALS

POPULATION AND ECONOMIC ACTIVITY

- Promote regional economic well-being through support of needed economic development in the Lake Michigan region.

- Promote sensible land use management and effective urban development and discourage urban sprawl in prime agricultural areas

- Maintain a quality environment while recognizing the interaction between the quality of the environment and other factors such as population and economic growth.

- Promote greater convenience in daily living conditions and higher health standards, beauty, and variety in area surroundings.

ENVIRONMENTAL PROTECTION

- To the maximum extent practical, protect, restore, and enhance the Lake Michigan environment.

- Minimize desecration and degradation of natural areas, woods, waterlands, and prairies through a coordination of efforts by Federal, State, and local governments.

- Achieve a better and more thorough adjustment between man and environment.

- Ensure that environmental problems such as air, water, and other resource pollution, public water supply, solid waste disposal, and noise are closely related and addressed as a unified whole.

- Preserve sufficient wild land areas and preserve scientific areas to provide representative examples of all types of geological features and terrestrial and aquatic communities native to the Lake Michigan region, insuring not only their preservation for the future, but also their availability for research and educational use at all levels of instruction.

AGRICULTURAL PRODUCTION

- Maintain and enhance the long-term productive potential of essential agricultural lands through sound management and protection from damaging development.

- Insure adequate supplies of high quality food and fiber for a growing population at reasonable prices to consumers.

- Develop an agriculture that will (a) return to farmers comparable incomes to what their resources and talents would pay them in other occupations and (b) strengthen individually owned farm operations.

- Protect the quality of our environment from pollution from agricultural wastes and chemicals used in food and fiber production.

- Conserve and develop natural resources used in agriculture. land, soil, energy, minerals, water.

- Describe, identify, and delineate prime agricultural lands and undertake measures to preserve them.

- Improve croplands and grasslands in an economical manner

- Reduce agricultural flood damages presently occurring in the Lake Michigan region.

FORESTRY

- Provide management, services, and protection to improve productivity of the Lake Michigan region's forest land to increase the sustained yield flow of forest products now and in the future to the wood-using industrial complex and to provide multiple use benefits of a varied nature to meet the recreational demands and needs of the people of the region.

- Maintain and enhance the long-term productive potential of essential forest lands through sound management and protection from damaging or premature development.

- Institute adequate forest management programs for more of the region's forest area.

- Protect the region's forests from fire, livestock, insect pests, disease, and other destructive agents.

LAND RESOURCES

- Protect the Lake Michigan region's soil resources to assure their continued availability for all beneficial uses by preventing adverse land uses and reducing off-site damage due to winds and water-carried soil material.

- Provide suitable regulations to insure adequate supplies of productive soil areas and enforce good soil management practices.

- Protect all soils from irreversible damage which will render them less fit for plant growth and absorption of precipitation.

- Give an especially high priority to the protection of soils with a high potential for agricultural crop production.

- Control building and construction activities to minimize soil loss during the periods when soil is exposed.

- Adopt and enforce land use practices, which will minimize soil degradation and off-site damages.

DRAINAGE AND WETLAND PROTECTION

- Identify and evaluate unique water-oriented natural environments such as wetlands, bogs, and estuary areas and determine the relative value of these resources so that the most valuable can be preserved or protected on a priority basis.

- Protect marsh and spawning areas in their natural state.

- Carefully assess all drainage proposals as to their environmental impact.

SHORELAND AND FLOOD PLAIN MANAGEMENT

- Promote a continued and more effective flood plain management program.

- Regulate development of flood plains in order to protect human life and health, minimize expenditures of public monies for costly flood control projects, repair of damaged public facilities in the flood plain, rescue and relief efforts, minimize business interruptions, maintain a stable tax base; and discourage victimization of unwary land and home buyers.

- Reduce health, safety, and economic risks to the individual because of flood hazard.

- Increase awareness and community participation in the National Flood Insurance Program.

- Develop and administer a systematic approach of erosion control to reduce damage to public and private properties caused by beach and bluff erosion

- Develop and administer a regionally-oriented, systematic strategy for erosion management.

- Provide technical and monetary assistance for structural and non-structural solutions to bluff instability

- Administer land and water use regulations necessary to mitigate future damages due to erosion.

- Continue data gathering and analysis of the Great Lakes water system and causes of shoreline erosion damages.

- Provide technical and financial assistance for design, location, and maintenance of erosion control structures

WATER QUALITY

- Interstate waters should meet requirements for recreational use and fish and aquatic life, except for variance allowed in Green Bay Lake Michigan should also meet standards for public water supply and thermal criteria (Wisconsin Administrative Code NR 102.05 and 103.05 through 103.08)

• . . .It is the policy of this state to restore and maintain the chemical, physical, and biological integrity of its waters to protect public health, safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, agricultural, and other uses of water. In order to achieve this policy, the legislature declares that:

(a) It is the goal of the State of Wisconsin to eliminate the discharge of pollutants into the waters of the State by 1985;

(b) It is also the goal of the State of Wisconsin that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by 1983;

(c) It is also the policy of the State of Wisconsin that the discharge of toxic pollutants in toxic amounts be prohibited.

(Wisconsin Department of Natural Resources, Chapter 147 on Pollution Discharge Elimination; 147 01)

• Because of the importance of Lakes Superior and Michigan and Green Bay as vast water resource reservoirs, water quality standards for those rivers emptying into Lakes Superior and Michigan and Green Bay shall be as high as is practicable (Wisconsin Department of Natural Resources, Chapter 144 on Water, Ice, Sewage, and Refuse, 144.025)

• . . .restore, maintain, and enhance the purity of the waters of the State, and assure that no contaminants are discharged into the waters of the State.

. . .insure against the discharge of contaminants into the environment to cause water pollution.

. . .enforce permit requirements for any increases in contaminant discharges into the water or for construction or installation of a sewer or sewage treatment facility. (Title 3, Section 12, State of Illinois Environmental Protection Act, Water Pollution, Illinois Rev. Statutes, Chapter 111 1/2, 1001-1051)

FISH AND WILDLIFE

• Protect, develop, maintain, and restore, where possible, the fishery resources of the Lake Michigan region consistent with their optimum production and utilization for recreational aesthetic enjoyment and commercial use.

• Make existing waters more productive through various management practices such as fish population rehabilitation and stocking of hatchery fish.

- Acquire adequate knowledge of the fisheries resource so that appropriate and effective programs can be devised.

- Assure preservation of and access to existing suitable waters and to waters that may become available in the future.

- Cooperate with both public and private groups in an effort to open lands and waters to the public wherever compatible with the existing use.

- Protect, develop, maintain, and restore, where feasible, the region's wildlife resources to provide optimum hunting and non-hunting recreational values and other social values and to perpetuate ecosystems necessary for public welfare.

- Establish regulations to adequately safeguard wildlife resources for future generations.

- Provide technical services to State, Federal, local, and the private sector regarding all phases of wildlife management.

- Preserve wetlands and other fish and wildlife habitats.

OUTDOOR RECREATION

- Preserve the natural resources of the Lake Michigan region for present and future generations.

- Preserve the region's cultural heritage.

- Provide outdoor recreational opportunities for utilizing resources without degrading them.

- Identify and protect important natural features and scenic areas.

- Implement policy and program changes and projects which will contribute to the solution of escalating conflicts and correction of major outdoor recreation opportunity conflicts.

- Restore and preserve stream and riverbank lands.

- Emphasize public acquisition of shoreland, open space, and park land.

- Acquire stream and river frontage to protect aesthetic and recreation values.

- Improve surface water supplies by acquiring access to lakes.

- Protect historic and archeological sites.

- Protect scenic areas along the Lake Michigan and Green Bay shorelines and Lake Michigan islands.

- Improve fishing and boating opportunities by accommodating bridges, piers, and breakwaters to fishing and by providing more and better harbors of refuge, docking facilities, and shore fishing structures.

- Develop more primitive and rustic camping facilities.

- Expand small boat harbor developments.

WATER SUPPLY

- Insure that water resource supply is as adequate as possible to meet present and anticipated demand.

- Project and quantify water needs on a regional planning basis in order to assure adequate water supplies for continued growth and viability of the region.

- Conserve and utilize the water resources of the Lake Michigan basin in the best interests of the people of the basin, and for the purpose of promoting the public health, safety, and welfare.

- Protect originating sources of water supply.

- Protect critical ground water recharge basins from development which increases surface runoff rates.

MINING

- Maintain and enhance the long-term potential of essential mineral-bearing lands through sound management and protection from damaging or premature development.

- Insure adequate and continuing supplies of minerals for a growing population at reasonable prices to consumers and consistent with environmental goals.

- Provide that the air, lands, fish and wildlife affected by prospecting or mining will receive the greatest practicable degree of protection and reclamation.

ENERGY

- Insure that an adequate and reliable supply of energy is available for the future populace of the Lake Michigan region consistent with environmental objectives and standards.

- Encourage private and public efforts to conserve energy resources

- Encourage the investigation and use of alternative energy sources.

- Achieve a high degree of planning and coordination between energy resource programs and natural resource management programs to minimize adverse environmental effects.

COMMERCIAL NAVIGATION

- Encourage the maintenance and expansion of present commercial navigation systems with full consideration of the environmental impacts of such development.

- Encourage ecologically sound maintenance dredging

- Maintain free and unobstructed navigation in Lake Michigan.

- Encourage the viability of Lake Michigan ports for commercial trade.

- Support efforts to mitigate constraints to Great Lakes shipping (e.g. conflicts with other transportation modes, limitations of the St Lawrence Seaway).

- Work to establish facilities for on-shore bilge pumping and sanitary treatment.

- Support equitable rate and regulatory structures among the various transportation modes and in comparison to ocean ports.

- Support optimum utilization of present facilities and encourage expansion, where needed, of support systems, especially as related to development of container facilities

LAKE HURON REGIONAL GOALS

POPULATION AND ECONOMIC ACTIVITY

- Promote a stable economic base with sound environmental considerations

- Promote regional economic well-being through support of needed economic development in the Lake Huron region.

- Maintain a quality environment while recognizing the interaction between the quality of the environment and other factors such as population and economic growth.

ENVIRONMENTAL PROTECTION

- Encourage adherence to environmental controls by industrial, agricultural, commercial, residential, and recreational users.

- Ensure that environmental problems such as air, water, and other resource pollution, public water supply, solid waste disposal, and noise are closely related and addressed as a unified whole

AGRICULTURAL PRODUCTION

- Maintain and enhance the long-term productive potential of essential agricultural lands through sound management and protection from damaging development.

- Insure adequate supplies of high quality food and fiber for a growing population at reasonable prices to consumers

- Protect the quality of the environment from pollution from agricultural wastes and chemicals used in food and fiber production.

- Describe, identify, and delineate prime agricultural lands and undertake measures to preserve them.

FORESTRY

- Maintain and enhance the long-term productive potential of essential forest lands through sound management and protection from damaging or premature development.

LAND RESOURCES

- Encourage residential designs in harmony with the natural landscape and man's need for open space.

- Protect the Lake Huron region's soil resources to assure their continued availability for all beneficial uses by preventing adverse land uses and reducing off-site damage due to winds and water-carried soil material

- Protect all soils from irreversible damage which will render them less fit for plant growth and absorption of precipitation

- Control building and construction activities to minimize soil loss during the periods when soil is exposed

DRAINAGE AND WETLAND PROTECTION

- Preserve natural and wetland areas for educational and aesthetic purposes

SHORELAND AND FLOOD PLAIN MANAGEMENT

- Protect the welfare of shoreline property owners from damages by Lake Huron activity

- Protect the region's coastline from potential abuse and overuse.

- Identify coastal areas of ecological and historical importance.

- Promote highway construction without destroying the aesthetic value and uniqueness of the shoreland environment.

- Advance public awareness of the value and uniqueness of their shorelands

- Promote increased communication and cooperation among local units of government involving shoreland management

WATER QUALITY

- Implement adequate wastewater management measures for the Great Lakes system to prevent further water quality degradation and to improve the water resource for present and future use.

- Minimize pollution from runoff by curtailing careless land disturbances during construction, using sound agricultural practices, and controlling urban area runoff.

FISH AND WILDLIFE

- Make existing waters more productive through various management practices such as fish population rehabilitation and stocking of hatchery fish

- Acquire adequate knowledge of the fisheries resource so that appropriate and effective programs can be devised

- Protect, develop, maintain, and restore, where feasible, the region's wildlife resources to provide optimum hunting and non-hunting recreational values and other social values and to perpetuate ecosystems necessary for public welfare

OUTDOOR RECREATION

- Preserve the natural resources of the Lake Huron region for present and future generations

- Identify areas in need of recreational facilities and supported by local governmental units.

WATER SUPPLY

- Insure that water resource supply is as adequate as possible to meet present and anticipated demand.

- Protect originating sources of water supply.

MINING

- Maintain and enhance the long-term potential of essential mineral-bearing lands through sound management and protection from damaging or premature development.

- Provide that the air, lands, waters, fish and wildlife affected by prospecting or mining will receive the greatest practicable degree of protection and reclamation.

ENERGY

- Encourage private and public efforts to conserve energy resources.

- Encourage the investigation and use of alternative energy sources.

- Achieve a high degree of planning and coordination between energy resource programs and natural resource management programs to minimize adverse environmental effects.

COMMERCIAL NAVIGATION

- Enhance the viability of Lake Huron ports for commercial trade.

LAKE ERIE REGIONAL GOALS

POPULATION AND ECONOMIC ACTIVITY

- Consider the finite capacity of the natural environment in matters of population growth and distribution.

- Develop a responsive economic system offering opportunities to all citizens consistent with environmental goals.

- Insure availability of water resources and facility capacity to support a reasonable rate of economic growth in the basin.

- Improve employment opportunities by protecting existing jobs, creating additional jobs and providing greater job security to the region's working force

- Provide for planned development of environmentally sound regional infrastructure facilities such as deep-water and land-based ports, power generation and transmission facilities, sewage treatment facilities, facilities for the transportation, refining, storage, and distribution of fossil fuels, and other water-oriented commercial and industrial developments essential to the economic viability of the region and its coastal communities.

- Promote rational socio-economic growth, reasonable use of resources, and an optimum level and variety of employment opportunities within the coastal zone.

- Establish economic diversity through compatible uses of coastal resources in appropriate locations.

- Develop a recommended policy on future growth within the coastal zone that considers the public interest, the protection of environmental resources, the impacts of facility sitings, and land and water use regulations, resource requirements and coastal access.

ENVIRONMENTAL PROTECTION

- Protect the fundamental rights of the people to enjoy a quality environment consistent with human health and well-being.

- Protect the natural processes and ecological relationships of man's life-support system.

- Manage man's activities to preserve natural, scenic, and aesthetic values of the environment while meeting society's needs.

- Minimize desecration and degradation of natural areas, woods, waterlands, and prairies through a coordination of efforts by Federal, State, and local governments.

- Encourage local planning and development programs to become more aware of their cumulative impacts on regional environmental resources.

- Abate and prevent water pollution, protect natural and scenic beauty of water areas and streams, and protect and enhance ecological systems.

- Protect, conserve, and restore water and related resources to levels of quality consistent with continued or increased well-being of residents of the basin.

- Achieve water of high quality in adequate supply to meet society's present and future needs, while enhancing scenic and aesthetic quality, and giving consideration to the natural distribution of surface and subsurface water to protect ecological systems.

- Foster, promote, create, and maintain conditions under which man and nature can thrive in harmony with each other, and achieve social, economic, and technological progress for present and future generations.

- Maintain a balance between environmental resource preservation and such economic activities as farming, manufacturing, shipping, and other basin transportation systems.

- Protect, restore, and maintain unique and high quality wildlife and vegetation habitats, fish spawning areas, and shellfish beds.

- Protect and preserve distinct geologic formations such as dunes, barrier beaches, islands, bluffs and cliffs, and unique features such as Niagara Falls.

- Recognize all wastes as potential resources and manage those resources for the protection, preservation, and enhancement of public health and environmental quality.

- Secure public participation through public hearings, public meetings, information programs, citizen committees, and other media to assist in the preservation and enhancement of the environmental resources in the Lake Erie basin

- Undertake effective environmental education to increase the public's understanding of environmental challenges and to stimulate participation in their solution

- Provide consistent standards to maintain at least present levels of environmental quality, and set levels for improvement of existing degradation.

- Provide guidelines for the development and utilization of all natural resources in order to avert degradation and depletion.

- Provide for regulation of, and enforcement of laws against, actions which adversely impact the environment.

- Intensify research, both into specific problems and into the interrelationship among problems in different elements of our environment and encourage and test innovative solutions

- Provide for increased intergovernmental and government-private coordination to recognize and avert serious environmental problems such as those affecting entire watersheds, airsheds, agricultural districts, and urban open space.

- Facilitate the broad exchange of environmental knowledge among public and private interests at all levels and provide all possible technical guidance to local governments, business, and individuals in order to ensure environmentally acceptable development and rehabilitation.

- Establish reasonable methods and schedules for environmental improvements and move toward imposing the costs of environmental protection directly on users of products and services in the original price

AGRICULTURAL PRODUCTION

- Consider environmental quality in the production of food and fiber free of contamination and disease.

- Maintain and enhance the long-term productive potential of essential agricultural lands through sound management and protection from damaging development.

FORESTRY

- Maintain and enhance the long-term productive potential of essential forest lands through sound management and protection from damaging or premature development.

LAND RESOURCES

- Ensure that surface and subsurface land uses are planned to be compatible with the resource capability and protect the general health and welfare of the people.

- Protect and improve the productive capacity of the soils, fields, and woodlands, and reclaim those land resources degraded by man or natural disasters.

- Protect those ecologically fragile and wild lands and preserve for posterity places having archeological, cultural, ecological, educational, recreational, historic, or scenic value.

- Conserve productive agricultural, forest, and mineral-bearing lands through good management and protection from damage and conflicting development.

- Promote orderly development within the coastal zone, particularly over large tracts of undeveloped land, along beachfronts, and along shorefronts of lakes, rivers and streams, so as to avoid land use conflicts and the unnecessary degradation of natural resources.

DRAINAGE AND WETLAND PROTECTION

- Preserve wetlands through public acquisition and enforcement of applicable laws.

SHORELAND AND FLOOD PLAIN MANAGEMENT

- Promote wise uses in such natural-hazard areas as flood plains, stream belts, bluffs, dunes and barrier beaches where development could unreasonably endanger life or property.

- Continue coastal zone management planning to preserve and protect existing shore zone resources.

- Preserve, protect, develop and, where possible, restore and enhance natural resources of the coastal zone for this and succeeding generations.

- Provide opportunities, for this and succeeding generations, to enjoy and use amenities within the coastal zone.

- Mitigate existing flood damage problems and minimize future flood damages.

- Make further evaluations of alternatives for regulating lake level fluctuations in the Great Lakes with State and local involvement and adequate consideration of environmental effects.

- Increase awareness and community participation in the National Flood Insurance Program.

- Promote sound flood plain management and assist in integrating flood plain management with local land use management.

- Limit development in flood-prone areas, and relocate over time existing flood prone developments such as housing, schools and hospitals, flood-proof existing structures where possible, and establish adequate flood warning system.

WATER QUALITY

- Implement adequate wastewater management measures for the Great Lakes system to prevent further water quality degradation and to improve the water resource for present use and future growth.

- Improve air and water quality in order to meet required standards.

- Further strengthen water pollution prevention and abatement; seek better ways to meet treatment needs; and expand the water quality monitoring network.

- Minimize pollution from runoff by curtailing careless land disturbances during construction, using sound agricultural practices and controlling urban area runoff

- Encourage land treatment and management practices to reduce agricultural runoff and other non-point pollution in rural areas

- Design urban management practices to reduce non-point pollution from stormwater runoff and other sources.

- Identify and develop institutional arrangements for implementation of regional or basinwide water quality plans.

FISH AND WILDLIFE

- Protect existing fish and wildlife habitats to ensure their preservation and integrity as an essential part of the environment

- Create new habitats and improve existing habitats for desirable fish and wildlife by innovative management of land and water resources

- Manage all species of fish and wildlife for their intrinsic and ecological values and benefits to man by providing conditions for natural propagation, improving fish hatcheries, controlling species that may conflict, and providing for harvest of selected species.

- Provide opportunity for enjoyment and maximum best use of fish and wildlife resources by hunters, fishermen, and nature lovers.

OUTDOOR RECREATION

- Provide adequate water and related land resources to meet present and future water-oriented and water-enhanced recreational needs.

- Maintain recreational resources and facilities adequate for the needs of society and compatible with the resource capability.

- Maintain a balance between development and preservation of natural resources to assure that all types of outdoor water-related recreational opportunities are available for present and future generations.

- Coordinate water-related outdoor recreation planning with overall land-use planning, of which it is an integral part

- Maximize recreational opportunities related to the unique resources of the coastal zone.

- Provide opportunities for public access and for public recreation in the coastal zone.

WATER SUPPLY

- Provide water supplies of adequate quantity and quality to meet short-range and long-range needs.

- Develop water resources to assure adequate supplies during water shortages and droughts, as well as other possible emergencies

- Promote regional water systems and system interconnections.

- Stress conservation measures that help insure the future availability of water resources.

- Conserve water supplies through metering, reuse, and protection of surface and groundwater sources, and the development and use of new technology.

- Assure the adequacy of water supply, including the protection of watersheds, aquifers, and recharge basins

- Suggest changes in water laws and institutional arrangements deemed necessary to assure the adequacy of present and future supplies and the equitable distribution thereof.

- Equitably allocate water among domestic, industrial, and agricultural users.

MINING

- Maintain and enhance the long-term potential of essential mineral-bearing lands through sound management and protection from damaging or premature development.

- Regulate the use and removal of mineral resources, particularly sand and gravel, natural gas, and off-shore oil deposits.

ENERGY

- Manage energy resources so that there will be an adequate supply to meet society's needs, while protecting environmental quality

- Develop an energy resources plan for the Great Lakes Basin giving consideration to potentials for energy production from renewable resources and energy conservation.

- Urge that the Federal government implement a national energy policy, which realistically assesses energy needs and supply, and commits the nation to developing alternative energy sources, minimizing future demand through appropriate load management techniques and conserving environmental values and resources.

- Increase the efficiency of electrical generation and transmission to conserve fuels and minimize environmental impact, prevent or use waste heat

- Require that energy implications be considered in land use and transportation decisions to reduce energy waste and environmental degradation.

- Apply stringent energy conservation measures for residential, commercial, and industrial energy use, including improved insulation requirements and mandatory product efficiency levels, in order to reduce energy waste

- Require all new and replacement generating plants to adhere strictly to all environmental and land use criteria.

COMMERCIAL NAVIGATION

- Investigate navigation and ports and harbors on the Great Lakes and determine necessary improvements, giving consideration to future navigation trends and impacts of present and future port and harbor facilities on adjoining land areas and other environmental resources.

- Recognize the importance of Lake Erie ports to the economy of the region.

- Develop a transportation system for the safe and efficient movement of people and goods consistent with the environmental goals.

LAKE ONTARIO REGIONAL GOALS

Because the entire Lake Ontario Region (ASA 08) lies within the State of New York, goals and objectives submitted by the New York State Department of Environmental Conservation are presented here in their entirety. These goals and objectives are arranged along the following boundaries State of New York, Great Lakes Basin, sub-basins, and the coastal zone.

State of New York - Goals and Objectives

Economic Development

1. Strengthen the State's economy by expanding the economic base and achieving sound growth and development in all phases of economic activity.

2. Improve employment opportunities by protecting existing jobs, creating additional jobs and providing greater job security to the State's working force.

Environmental

Goals

1. Conserve, improve and protect the State's natural resources and environment and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well being.

2. Develop and manage the basic resources of water, land and air to the end that the state may fulfill its responsibility as trustee of the environment for the present and future generations

3. Improve and coordinate the environmental plans, functions, powers and programs of the state, in cooperation with the federal government, regions, local governments, other public and private organizations and the concerned individual.

4. Foster, promote, create and maintain conditions under which man and nature can thrive in harmony with each other, and achieve social, economic and technological progress for present and future generations.

Objectives

Environmental Quality Standards - Provide consistent standards to maintain at least present levels of environmental quality, and set levels for improvement of existing degradation.

Development Guidelines - Provide guidelines for the development and utilization of all natural resources in order to avert degradation and depletion.

Regulation and Enforcement - Provide for regulation of, and enforcement of laws against, actions which adversely impact the environment.

Environmental Research - Intensify research, both into specific problems and into the interrelationship among problems in different elements of our environment and encourage and test innovative solutions.

Intergovernmental Coordination - Provide for increased intergovernmental and government-private coordination to recognize and avert serious environmental problems such as those affecting entire watersheds, airsheds, agricultural districts, and urban open space.

Environmental Information and Data Exchange - Facilitate the broad exchange of environmental knowledge among public and private interests at all levels and provide all possible technical guidance to local governments, business and individuals in order to ensure environmentally acceptable development and rehabilitation.

Transition and Adjustment - Establish reasonable methods and schedules for environmental improvements and move toward imposing the costs of environmental protection directly on users of products and services in the original price.

Priorities of Needs - Budget and carry out environmental programs in order of urgency, with first emphasis on halting further degradation, second on improving existing situations and third on forestalling future dangers.

Public Understanding - Undertake effective environmental education to increase the public's understanding of environmental challenges and to stimulate participation in their solution.

Sub-objectives

Land-Use

1. Develop land use guidelines to identify compatible and incompatible uses, relate environmental considerations such as energy, air and water, and incorporate public service needs such as water supply, solid waste management and recreational space.

2. Establish a statewide system for land use guidance, to fully account for local and regional and statewide environmental values and governments' capacity to provide sewers, water supply, solid waste disposal and other services.

3. Vastly refine the store of information such as soil capability, geology, plant types and associations, animal habitat, and ground-water recharge areas, as well as related land use information. Expand data retrieval and analysis systems.

4. Make land use plans effective by modernizing control powers at all levels of government, revamping the property tax, and using public facilities to promote environmentally sound development.

5. Protect the Adirondack Park through strong management of the Forest Preserve and sound private land use practices.

6. Conserve productive agricultural, forest and mineral bearing lands through good management and protection from damage and conflicting development.

Water Resources

7. Further strengthen water pollution prevention and abatement, seek better ways to meet treatment needs, expand water quality monitoring network.

8. Minimize pollution from runoff by curtailing careless land disturbances during construction, use of sound agricultural practices, and by controlling urban area runoff.

9. Conserve water supplies through metering, reuse and protection of surface and groundwater sources. Promote regional water systems and system interconnections. Equitably allocate water among domestic, industrial and agricultural users.

10. Limit development in flood-prone areas, and relocate over time existing flood prone developments such as housing, schools and hospitals. Flood-proof existing structures where possible. Establish adequate flood warning system.

11. Protect water quality, scenic integrity of lakes and recreational rivers against overuse and overbuilding of shorelines and adjacent areas. Balance recreation opportunities for swimming, boating, fishing and quiet relaxation, through best use allocations in keeping with natural capacity

Fish and Wildlife

12. Protect existing fish and wildlife habitats to ensure their preservation and integrity as an essential part of the environment.

13. Create new habitats and improve existing habitats for desirable fish and wildlife by innovative management of land and water resources.

14. Manage all species of fish and wildlife for their intrinsic and ecological values and benefits to man by providing conditions for natural propagation, improving fish hatcheries, controlling species that may conflict and providing for harvest of selected species.

15. Provide opportunity for enjoyment and maximum best use of fish and wildlife resources by hunters, fishermen and nature lovers.

Energy

16. Urge that the federal government implement a national energy policy, which realistically assesses energy needs and supply, and commits the nation to developing alternative energy sources, minimizing future demand through appropriate load management techniques, and conserving environmental values and resources

17. Increase the efficiency of electrical generation and transmission to conserve fuels and minimize environmental impact. Minimize or use waste heat.

18. Require that energy implications be considered in land use and transportation decisions to reduce energy waste and environmental degradation.

19. Apply stringent energy conservation measures for residential, commercial, and industrial energy use, including improved insulation requirements and mandatory product efficiency levels, in order to reduce energy waste.

20. Require all new and replacement generating plants to adhere strictly to all environmental and land use criteria.

Great Lakes Basin

General

1. Environmental Quality

Protect, conserve and restore water and related resources to levels of quality consistent with continued or increased well-being of residents of the basin.

2. Regional Development

Insure availability of water resources and facility capacity to support a reasonable rate of economic growth in the basin.

Basinwide

1. Lake Level Studies

Make further evaluations of alternatives for regulating lake level fluctuations in the Great Lakes with State and local involvement and adequate consideration of environmental effects.

2. Energy Resources

Develop an energy resources plan for the Great Lakes Basin giving consideration to potentials for energy production from renewable resources and energy conservation.

3. Wastewater Management

Implement adequate wastewater management measures for the Great Lakes system to prevent further water quality degradation and to improve the water resource for present use and future growth.

4. Navigation and Ports and Harbors

Investigate navigation and ports and harbors on the Great Lakes and determine necessary improvements giving consideration to future navigation trends and impacts of present and future port and harbor facilities on adjoining land areas and other environmental resources.

St. Lawrence River Sub-basin

1. Conduct more detailed studies of the operation of existing hydroelectric power plants and develop alternative regulation patterns to minimize existing problems giving full consideration to the economic and environmental aspects.

2. Undertake a lake level regulation study of the Lake Ontario-St. Lawrence River Subsystem of the Great Lakes with New York State and local representation to develop improved methods of regulating the subsystem and obtain data on high and low water level conditions for use in management of shoreline areas.

Black River Sub-basin

1. Implement a comprehensive non-structural flood plain management program in the Black River Flats through cooperative Federal, State and local efforts.

2. Improve water quality in the Black River by pollution abatement measures and accelerate implementation of fish and wildlife management measures and development of recreation sites along the Black River.

3. Reevaluate the feasibility of developing additional hydroelectric capacity in the Black River Basin based on the recent increased costs of alternative fossil fuel energy sources.

Oswego River Sub-basin

1. Establish a basin management agency to provide central management and control of the basin system of water and related resources.

2. Implement a priority system for water use, lake target level objectives and streamflow objectives using the Oswego River Basin Plan as a guide coordinating with local interests.

3. Conduct Level C studies through the Corps of Engineers with State and local involvement to implement lake level regulation and flood damage reduction measures.

Genesee River Sub-basin

1. Develop and implement a basinwide flood damage reduction program making full use of applicable non-structural and structural measures.

2. Reevaluate the feasibility of the Stannard multipurpose reservoir project in the headwaters of the Genesee River if warranted by changing conditions that may make the project economically justifiable and environmentally acceptable.

Erie-Niagara Sub-basin

1. Continue the Corps of Engineers Buffalo Urban Area Study to develop flood damage reduction measures for flood problem areas along the many tributary streams utilizing appropriate structural and non-structural measures.

2 Continue implementation of the ongoing State and local water quality management program to meet stream water quality standards giving additional emphasis to urban stormwater runoff and non-point sources of pollution.

Coastal Zone - State Goals and Objectives for Great Lakes-Lake Erie and Lake Ontario

Goal

To preserve, protect, develop and where possible, restore and enhance natural resources of the State's coastal zone for this and succeeding generations.

Objectives

- Preservation of the wetlands through public acquisition, enforcement of the Tidal Wetlands Act, and comparable acquisition and legislation for the protection of freshwater wetlands.

- Protection, restoration and maintenance of unique and high quality wildlife and vegetation habitats, fish spawning areas, and shellfish beds.

- Protection and preservation of distinct geologic formations such as dunes, barrier beaches, islands, bluffs and cliffs, and unique features such as Niagara Falls.

- Regulation of the use and removal of mineral resources, particularly sand and gravel, natural gas, and off-shore oil deposits.

Goal

To provide opportunities, for this and succeeding generations, to enjoy and to use amenities within the coastal zone.

Objectives

- Provision of opportunities for public access and for public recreation in the coastal zone.

- Preservation and enhancement of high quality and varied scenic views and vistas.

- Preservation, restoration and maintenance of historic and unique natural sites, districts or artifacts.

Goal

To promote the health, safety, welfare, and economic well-being of all citizens through wise use and management of the State's coastal zones.

Objectives

- Promotion of orderly development within the coastal zone, particularly over large tracts of undeveloped land, along beachfronts, and along shorefronts of lakes, rivers and streams, so as to avoid land use conflicts and the unnecessary degradation of natural resources.

- Provision for planned development of environmentally sound statewide and regional infrastructure facilities such as deep-water and land-based ports, power generation and transmission facilities, sewage treatment facilities, facilities for the transportation, refining, storage and distribution of fossil fuels, and other water-oriented commercial and industrial developments essential to the economic viability of the State and its coastal communities.

- Improvement of air and water quality in order to meet required standards.

- Assurance of the adequacy of water supply, including the protection of watersheds, aquifers and recharge basins

- Promotion of wise uses in such natural-hazard areas as flood plains, stream belts, bluffs, dunes and barrier beaches where development could unreasonably endanger life or property.

- Preservation of high viability agricultural and forest lands.

Goal

To coordinate the plans, programs and projects of various governmental and private interests involved in the coastal zone

Objectives

- Effective monitoring of federal, interstate, State and local plans, programs, and policies in order to avoid duplication and waste.

- Assurance of opportunity for public interests to be represented in the development and implementation of a coastal zone management program.

- Assurance of compatibility of a coastal zone management program with existing and future public programs and policies.

- Identification of coastal zone development decisions having regional or statewide implications and the development of policies and procedures for making development decisions when local and regional or statewide interests are in conflict.

SOCIO-ECONOMIC CHARACTERISTICS

Projections of population, economic activity, energy production, and land use are at the heart of the Assessment process. To determine future resource demands, needs, and requirements, an initial analysis of current and projected socio-economic factors is necessary. The following tables of socio-economic characteristics were sent to State and some Federal members of the Great Lakes National Assessment Work Group Work Group members were given the options of indicating: a preference for either the Framework Study or Assessment projections, no preference (i e , the projections represent a reasonable range of future conditions), or that neither of the projections are satisfactory (in this case, the Work Group member was asked to supply us with an alternative set of projections).

The socio-economic characteristics are presented by Aggregated Subareas (ASAs). After each table, the State preference is specified, along with the National Assessment Work Group recommendation for adoption as the State-Regional Future condition This recommendation is based on State preferences and comments from the Public Review Group and the rest of the Work Group. Those Public Review Group comments which indicate disagreement with the recommended projections are also included.

LAKE SUPERIOR REGION - ASA 01

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION Great Lakes (04)	ASA No 01	AREA (in acres x 1000) 16,998 4
STATES MN, WI, MI	COUNTIES Minnesota (4), Wisconsin (4), Michigan (9)	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	533 5	537 9	594 6	534 8	531 3	528 2
SMSA	------	------	------	------	259 3	249 4
Non-SMSA	------	------	------	------	272 0	278 8
Total Employment Number (000)	171 8	194 8	221 8	192 2	202 7	214 7
Total FS 1958 $ Earnings (000) NA 1967 $	------	1,510,310	2,965,087	1,346,400	1,793,300	2,756,500
Per FS 1958 $ Capita Income NA 1967 $	------	3,658	6,631	3,343	4,519	7,043
Steam-Electric Energy Production (GWH)	3,332	4,638	28,290	3,334	3,761	36,655
Land and Water Area- Acres (000)	16,998 4			16,998 4		
Total Surface Water	1,083 1			------		
Land Use, Total Area	15,915 3			------		
Agriculture,- Total	858 2	858 2	857 7	1,222	1,971	1,700
Cropland	692 9	692 9	692 5	552[1]	859[1]	1,126[1]
Pasture	165 3	165.3	165 2	223	971	433
Forest & Woodland Grazed	------	------	------	447	139	139
Urban	422 3	423 0	431 8	------	------	------
Forest	14,264 5	14,263 8	14,255 8	------	------	------
Wetlands	------	------	------	------	------	------
Other	370 3	370 3	370 3	------	------	------

1 Includes Non-Rotation Hayland

LAKE SUPERIOR REGION - ASA 01

MINNESOTA

The projections developed for the 1975 National Assessment in general appear to be more appropriate in almost all cases than those generated for the Framework Study.

1. Per Capita Income - The increased income from 1975 to 2000 in the NA projections seems to be too high. The same is true for the FS projections. Income in constant dollars has doubled over the last 20 to 25 years but this has been largely due to massive technological improvements and changes in the various economic sectors. It seems questionable that this trend can be maintained

2. Steam Electric Energy Production - It seems that the 1985 projection of power in both the FS and the NA are too low, based on what the major power companies are projecting for Minnesota In addition, the 2000 projections for power are difficult to evaluate A 10-fold increase in power production over a 25 year period seems too high.

3. Agriculture - Cropland - Because of the physical and climatic conditions found in northeastern Minnesota, it seems highly unlikely that cropland will increase Minnesota assumes these figures are reflecting changes in Wisconsin or Michigan.

WISCONSIN

Wisconsin recommends using all of the National Assessment figures that are supplied. They suggest rechecking the N A Steam-Electric Energy Production figures shown for the year 2000 It seems suspiciously high

MICHIGAN

No preference

PUBLIC REVIEW GROUP COMMENTS

Regional and local population forecasts project significant growth for the area as opposed to the decline suggested by the OBERS Series E projections. - Kay Jennings, Metropolitan Interstate Committee

The projections for energy production by the year 2000 appear to be unrealistic and excessive. - K. A Carlson, Minnesota Power and Light Company

The long-range, year 2000, forecasts appear reasonable. Electric energy production forecasts for 1985 reflect an unreasonably low growth rate - J K. Babbit, Wisconsin Michigan Power Company

The steam-electric energy production figures seem to be high for the basin generally and for Wisconsin in particular - Stephen Born, Wisconsin State Planning Office

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future, for all categories except land use, with the caveat that the steam-electric energy production figures may be too high for the year 2000. For land use, adopt the Framework Study figures

NORTHWESTERN LAKE MICHIGAN REGION - ASA 02

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION Great Lakes (04)	ASA No 02	AREA (in acres x 1000) 11,171 2
STATES MI, WI	COUNTIES Michigan (4), Wisconsin (20),	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	1,005	1082 1	1,357	1076 5	1131 9	1192 1
SMSA	-------	-------	-------	-------	499 5	547 6
Non-SMSA	-------	-------	-------	-------	632 4	645 5
Total Employment Number (000)	371 0	412 9	462 7	430 1	472 9	518 4
Total FS 1958 $ Earnings (000) NA 1967 $	-------	3,128,448	6,842,315	2,935,711	4,139,018	6,602,300
Per FS 1958 $ Capita Income NA 1967 $	-------	3,872	6,646	3,513	4,761	7,290
Steam-Electric Energy Production (GWH)	4,648	15,149	47,968	13,786	14,354	47,547
Land and Water Area- Acres (000)	10,401 9[2]			11,171 2[2]		
Total Surface Water	391 2			-------		
Land Use, Total Area	10,010 7			-------		
Agriculcure,- Total	3673 1	3664 2	3647 6	4,480	4,527	4,507
Cropland	3316 4	3308 4	3293 4	3,142[1]	3,280[1]	3,261[1]
Pasture	356 7	355 8	354 2	432	1,037	1,037
Forest & Woodland Grazed	-------	-------	-------	905	208	207
Urban	464 0	487 0	530 2	-------	-------	-------
Forest	5116 6	5104 2	5081 0	-------	-------	-------
Wetlands	-------	-------	-------	-------	-------	-------
Other	757 1	755 3	751 9	-------	-------	-------

1 Includes Non-Rotation Fayland

2 ASA 02 = PSA 2 1 plus Delta County

SOUTHWESTERN LAKE MICHIGAN REGION - ASA 03

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION Great Lakes (04)	ASA No 03	AREA (in acres x 1000) 5315 8
STATES IL, IN, WI	COUNTIES Illinois (6), Indiana (4), Wisconsin (7)	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	9492 8	10,999	13,844 5	9987 7	10,764 4	11,913 1
SMSA	-------	-------	-------	-------	10,549 7	11,680 8
Non-SMSA	-------	-------	-------	-------	214 7	232 3
Total Employment Number (000)	3842 9	4624 5	5834 8	4,401	4930 6	5619 2
Total FS 1958 $ Earnings (000) NA 1967 $	-------	42,057,354	84,959,603	39,547,700	55,688,200	89,135,700
Per FS 1958 $ Capita Income NA 1967 $	-------	4,849	7,999	4,824	6,407	9,432
Steam-Electric Energy Production (GWH)	29,769	58,920	208,044	49,426	89,149	164,768
Land and Water Area- Acres (000)	5315 8			5315 8		
Total Surface Water	103 7			-------		
Land Use, Total Area	5212 1			-------		
Agriculture,- Total	3080 8	2683 8	2166 8	3,083	3,152	2,868
Cropland	2843 4	2477 0	1999 8	2,701[1]	2,287[1]	2,018[1]
Pasture	237 4	206 8	167 0	185	818	805
Forest & Woodland Grazed	-------	-------	-------	196	47	43
Urban	1210 5	1762 2	2397 7	-------	-------	-------
Forest	340 7	296 8	239 7	-------	-------	-------
Wetlands	-------	-------	-------	-------	-------	-------
Other	580 1	505 3	407 9	-------	-------	-------

1 Includes Non-Rotation Hayland

EASTERN LAKE MICHIGAN REGION - ASA 04

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION Great Lakes (04)	ASA No 04	AREA (in acres x 1000) 16,796 1
STATES IN, MI	COUNTIES Indiana (6), Michigan (39)	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	3019 1	3461 2	4443 3	3110 0	3385 6	3756 8
SMSA	-------	-------	-------	-------	2119 6	2390 0
Non-SMSA	-------	-------	-------	-------	1266 0	1363 8
Total Employment Number (000)	1134 0	1340 6	1747 3	1284 5	1462 3	1686 8
Total FS 1958 $ Earnings (000) NA 1967 $	-------	10,509,845	23,081,051	9,424,100	13,688,800	22,737,500
Per FS 1958 $ Capita Income NA 1967 $	-------	3,872	6,794	3,893	5,250	7,951
Steam-Electric Energy Production (GWH)	12,645	31,688	128,162	22,783	37,783	96,441
Land and Water Area- Acres (000)	17,565 4[2]			16,796 1[2]		
Total Surface Water	515 8			-------		
Land Use, Total Area	17,049 6			-------		
Agriculture,- Total	7667 5	7588,6	7467 2	7 083	7,632	7,439
Cropland	6856 3	6784 0	6672 9	5,303[1]	5,886[1]	5,885[1]
Pasture	811 2	804 6	794 3	912	1,548	1,358
Forest & Woodland Grazed	-------	-------	-------	867	196	195
Urban	1233 3	1353 4	1541 9	-------	-------	-------
Forest	7139 0	7106 3	7052 4	-------	-------	-------
Wetlands	-------	-------	-------	-------	-------	-------
Other	1009 8	1001 3	988 1	-------	-------	-------

1 Includes Non-Rotation Harvland

2 ASA 04 = PSA 2 3 and PSA 2 4 minus Delta County

NORTHWESTERN LAKE MICHIGAN REGION - ASA 02

MICHIGAN

No preference

WISCONSIN

Wisconsin recommends using all of the National Assessment figures that are supplied. They suggest rechecking the N.A. Steam-Electric Energy Production figure shown for the year 2000 It seems suspiciously high.

PUBLIC REVIEW GROUP COMMENTS

The long-range, year 2000, forecasts appear reasonable Electric energy production forecasts for 1985 reflect an unreasonably low growth rate. - J K. Babbitt, Wisconsin Michigan Power Company

The steam-electric energy production figures seem to be high for the basin generally and for Wisconsin in particular - Stephen Born, Wisconsin State Planning Office

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future for all categories except for land use. Adopt the Framework Study land use figures.

SOUTHWESTERN LAKE MICHIGAN REGION - ASA 03

WISCONSIN

Wisconsin recommends using all of the National Assessment figures that are supplied. They suggest rechecking the N A Steam-Electric Energy Production figure shown for the year 2000 It seems suspiciously high.

ILLINOIS

It appears that either projection is reasonable However, the Framework Study figures appear most accurate regarding land use issues.

INDIANA

In all cases it appears either projection is reasonable and seemingly accurate

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future for all categories except for land use. Adopt the Framework Study land use figures.

EASTERN LAKE MICHIGAN REGION - ASA 04

INDIANA

In all cases it appears either projection is reasonable and seemingly accurate.

(continued on page 49)

LAKE HURON REGION - ASA 05

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION Great Lakes (04)	ASA No 05	AREA (in acres x 1000) 8628.4
STATES MI	COUNTIES Michigan (22)	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	1263 3	1411 1	1809 2	1315 8	1469 7	1678 6
SMSA	-------	-------	-------	-------	1019 4	1192 4
Non-SMSA	-------	-------	-------	-------	450 3	486 2
Total Employment Number (000)	422 1	530 2	698 0	500 2	586 3	706 8
Total FS 1958 $ Earnings (000) NA 1967 $	-------	4,462,200	9,844,800	4,266,400	6,337,300	10,796,300
Per FS 1958 $ Capita Income NA 1967 $	-------	4,300	7,159	3,962	5,350	8,116
Steam-Electric Energy Production (GWH)	7,512	36,746	148,956	5,650	9,836	36,126
Land and Water Area- Acres (000)	8268 4			8628 4		
Total Surface Water	186 5			-------		
Land Use, Total Area	8441 9			-------		
Agriculture,- Total	3260 0	3225 5	3175 4	3,126	3,587	3,546
Cropland	2901 2	2869 5	2823 4	2,288[1]	2,690[1]	2,651[1]
Pasture	358.8	356 0	352 0	317	782	782
Forest & Woodland Grazed	-------	-------	-------	521	113	113
Urban	568 6	629 0	715 9	-------	-------	-------
Forest	4109 0	4087 3	4056 5	-------	-------	-------
Wetlands	-------	-------	-------	-------	-------	-------
Other	504 3	500 1	494 1	-------	-------	-------

1 Includes Non-Rotation Hayland

EASTERN LAKE MICHIGAN REGION - ASA 04 (continued)

MICHIGAN

No preference

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future for all categories except for land use. Adopt the Framework Study land use figures.

LAKE HURON REGION - ASA 05

MICHIGAN

No preference

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future for all categories except for land use. Adopt the Framework Study land use figures

WESTERN LAKE ERIE REGION - ASA 06

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION Great Lakes (04)	ASA No 06	AREA (in acres x 1000) 10,430 8
STATES MI, IN, OH	COUNTIES Michigan (9), Indiana (3), Ohio (20)	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	6,573 5	7765.2	9899 0	6928 9	7610 1	8544 2
SMSA	-------	-------	-------	-------	6435 9	7239 3
Non-SMSA	-------	-------	-------	-------	1174 2	1304 9
Total Employment Number (000)	2482 3	3058 2	3950 5	2876 3	3301 5	4491 6
Total FS 1958 $ Earnings (000) NA 1967 $	-------	27,671,700	57,393,100	26,229,200	37,663,800	61,535,500
Per FS 1958 $ Capita Income NA 1967 $	-------	4,498	7,526	4,547	6,053	8,989
Steam-Electric Energy Production (GWH)	38,992	56,285	167,737	43,532	97,089	201,212
Land and Water Area- Acres (000)	10,430 8			10,430 8		
Total Surface Water	130 9			-------		
Land Use, Total Area	10,299 8			-------		
Agriculture,- Total	7282 2	7014 9	6625 3	7,360	7,255	7,060
Cropland	6950 7	6696 4	6325 8	6,297[1]	6,616[1]	6,417[1]
Pasture	331 5	318 5	299 5	517	570	575
Forest & Woodland Grazed	-------	-------	-------	546	68	67
Urban	1327 2	1684 4	2203 1	-------	-------	-------
Forest	1119 1	1053 3	959 1	-------	-------	-------
Wetlands	-------	-------	-------	-------	-------	-------
Other	571 3	547 2	512 3	-------	-------	-------

1 Includes Non-Rotation Hayland

EASTERN LAKE ERIE REGION - ASA 07

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION	ASA No	AREA (in acres * 1000)
Great Lakes (04)	07	5445 2

STATES	COUNTIES
OH, PA, NY	Ohio (8), Pennsylvania (1), New York (4)

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	4940 3	5534 4	6895 2	5055 8	5323 0	5718 3
SMSA	-------	-------	-------	-------	4990 4	5369 9
Non-SMSA	-------	-------	-------	-------	332 6	348 4
Total Employment Number (000)	1913 9	2225 0	2785 6	2116 0	2327 2	2599 9
Total FS 1958 $ Earnings (000) NA 1967 $	-------	19,161,600	39,193,800	26,229,200	37,663,800	61,535,000
Per FS 1958 $ Capita Income NA 1967 $	-------	4,413	7,436	4,323	5,782	8,648
Steam-Electric Energy Production (GWH)	22,032	40,513	146,652	27,142	50,761	115,093
Land and Water Area- Acres (000)	5445 2			5445 2		
Total Surface Water	66 7			-------		
Land Use, Total Area	5378 5			-------		
Agriculture,- Total	1983 9	1889 2	1715 7	2,050	2,416	2,334
Cropland	1600 0	1521 2	1376 9	1,346 [1]	1,326 [1]	1,254 [1]
Pasture	383 9	368 0	338 8	305	891	887
Forest & Woodland Grazed	-------	-------	-------	398	198	191
Urban	1094 0	1287 0	1640 0	-------	-------	-------
Forest	1903 3	1831 0	1699 5	-------	-------	-------
Wetlands	-------	-------	-------	-------	-------	-------
Other	397 3	371 3	323 3	-------	-------	-------

1 Includes Non-Rotation Hayland

WESTERN LAKE ERIE REGION - ASA 06

MICHIGAN

No preference

INDIANA

In all cases it appears either projection is reasonable and seemingly accurate.

OHIO

The State of Ohio feels that those figures projected by the 1975 National Assessment are more accurate than those projected by the Framework Study. Framework Study figures project significantly higher levels of activity than Ohio is expected to achieve to the year 2000. Ohio's projections (DEMOS, developed by the Battelle Memorial Laboratories for the Ohio Department of Economic and Community Development) closely parallel OBERS "E" projections utilized in the 1975 National Assessment. Discrepancies between DEMOS and OBERS "E" are not significant.

PUBLIC REVIEW GROUP COMMENTS

"I don't think either (energy) projection will come to pass We have seen a flattening of the demand curve over the past two years In addition, difficulties in raising capital will severely limit utilities' construction plans, while ever-rising rates will dampen consumer demand. In addition, more and more environmental attacks, some of which will be successful, will be mounted against proposed plants The overall result will be increased emphasis on energy conservation." - Denis Binder, University of Puget Sound School of Law (formerly with Ohio Northern University)

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future for all categories except for land use. Adopt the Framework Study land use figures.

EASTERN LAKE ERIE REGION - ASA 07

OHIO

The State of Ohio feels that those figures projected by the 1975 National Assessment are more accurate than those projected by the Framework Study. Framework Study figures project significantly higher levels of activity than Ohio is expected to achieve to the year 2000. Ohio's projections (DEMOS, developed by the Battelle Memorial Laboratories for the Ohio Department of Economic and Community Development) closely parallel OBERS "E" projections utilized in the 1975 National Assessment. Discrepancies between DEMOS and OBERS "E" are not significant.

PENNSYLVANIA

The basis for population estimates (in the State Water Plan) was the 1975 OBERS projection with adjustments for local factors, e.g., impacts of future highway locations. An average of Series C and E was used to 1975, and Series E was used thereafter. The State of Pennsylvania also supplied the GLBC with population and land use projections for the Lake Erie subbasin (hydrologic boundaries) and Erie County. A comparison of the population growth rate trends reveals that the State projections are very close to the OBERS Series E projections used in the Assessment.

Area	Source of Projections	1970	1980	1990	2000
Lake Erie Subbasin (within PA)	PA State Water Plan	232,487	236,800	253,100	268,600
Erie County	PA State Water Plan	263,654	270,800	290,400	309,400
ASA 07 (Ohio-PA-NY)	OBERS Series E	4,954,400	5,182,000	5,467,800	5,718,200
Subarea 0412 (PA-NY)	OBERS Series E	1,845,500	1,844,900	1,933,300	2,010,800
Subarea 0412	Framework Study	1,841,800	2,058,000	2,288,200	2,506,000

PERCENT CHANGE IN POPULATION

Area	Source of Projection	1970-80	1970-90	1970-2000
Lake Erie Subbasin (within PA)	PA State Water Plan	2	9	16
Erie County	PA State Water Plan	3	10	17
ASA 07 (Ohio-PA-NY)	OBERS Series E	5	10	15
Subarea 0412 (PA-NY)	OBERS Series E	-	5	9
Subarea 0412	Framework Study	12	24	36

It was not practical to compare Pennsylvania land use trends for the Lake Erie Subbasin to the aggregated figures used in the Assessment.

NEW YORK

Regarding a choice between the GLB Framework Study and 1975 National Assessment figures in the report, New York prefers the National Assessment since they should be somewhat closer to values based on State population projections.

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future for all categories except for land use. Adopt the Framework Study land use figures.

LAKE ONTARIO-ST. LAWRENCE REGION - ASA 08

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION Great Lakes (04)	ASA No 08	AREA (in acres x 1000) 11,120 0
STATES NY	COUNTIES New York (20)	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	2531 7	2775 6	3494 9	2380 9	2639 2	3019 4
SMSA	-------	-------	-------	-------	1867 1	2202 5
Non-SMSA	-------	-------	-------	-------	772 2	816 9
Total Employment Number (000)	964 4	1108 8	1411 8	996	1160 9	1385 1
Total FS 1958 $ Earnings (000) NA 1967 $	-------	9,084,881	19,980,838	7,759,200	11,475,300	19,632,900
Per FS 1958 $ Capita Income NA 1967 $	-------	4,210	7,320	4,130	5,572	8,438
Steam-Electric Energy Production (GWH)	10,774	45,536	73,652	16,948	35,579	123,480
Land and Water Area- Acres (000)	11,721 0[2]			11,120[2]		
Total Surface Water	449 3			-------		
Land Use, Total Area	11,271 7			-------		
Agriculture,- Total	4309 1	4261 3	4197 9	4,013	4,791	4,355
Crooland	3448 1	3408 8	3356 8	2,758[1]	2,672[1]	3,007[1]
Pasture	861 0	852 5	841 1	560	1,714	945
Forest & Woodland Grazed	-------	-------	-------	695	404	401
Uroan	667 7	770 9	909 7	-------	-------	-------
Forest	5632 6	5584 6	5518 8	-------	-------	-------
Wetlands	-------	-------	-------	-------	-------	-------
Other	662 3	654 9	645 3	-------	-------	-------

1 Includes Non-Rotation hayland

2 ASA 08 = 5 1, PSA 5 2, and PSA 5 3 minus Oneida and Herkimer Counties and plus Franklin County

LAKE ONTARIO - ST. LAWRENCE REGION - ASA 08

NEW YORK

Regarding a choice between the GLB Framework Study and 1975 National Assessment figures in the report, New York prefers the National Assessment since they should be somewhat closer to values based on State population projections.

WORK GROUP RECOMMENDATION

Adopt the National Assessment projections as the State-Regional Future for all categories except for land use. Adopt the Framework Study land use figures.

GREAT LAKES REGION - ASAs 01-08

1975 NATIONAL ASSESSMENT
State-Regional Future
SOCIO-ECONOMIC CHARACTERISTICS

REGION: Great Lakes (04)	ASA No 01-08	AREA (in acres x 1000) 85,905 9
STATES 8	COUNTIES 190	

CHARACTERISTICS/ UNITS	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Population,- Total Number (000)	29,332 3	33,566 2	42,338 2	30,390 4	32,855 2	36,351 3
SMSA	----------	----------	----------	----------	27,740 9	30,871 9
Non-SMSA	----------	----------	----------	----------	5,114 4	5,479 4
Total Employment Number (000)	11,302 3	13,495 0	17,175 5	12,796 4	14,446 5	16,582 7
Total FS 1958 $ Earnings (000) NA 1967 $	----------	117,586 3	243,703 6	109,475 9	155,688 9	252,438 2
Per FS 1958 $ Capita Income NA 1967 $	----------	4,453	7,516	4,418	5,903	8,803
Steam-Electric Energy Production (GWH)	104,414	289,475	949,461	182,601	338,312	821,322
Land and Water Area- Acres (000)	86,506 9			85,905 9		
Total Surface Water	2,927 2			----------		
Land Use, Total Area	83,579 7			----------		
Agriculture,- Total	32,114 8	31,185 7	29,853 6	32,417	35,331	33,809
Cropland	28,609 0	27,758 2	26,541 5	24,387 [1]	25,616 [1]	25,619 [1]
Pasture	3,505 8	3,427 5	3,312 1	3,451	8,331	6,822
Forest & Woodland Grazed	----------	----------	----------	4,575	1,373	1,355
Urban	6,987 7	8,360 9	10,370 3	----------	----------	----------
Forest	39,624 7	39,327 3	38,862 8	----------	----------	----------
Wetlands	----------	----------	----------	----------	----------	----------
Other	4,852 5	4,705 7	4,492 9	----------	----------	----------

NATURAL RESOURCES OF THE GREAT LAKES BASIN

The Great Lakes Basin, connected to the sea by the St. Lawrence, comprises an environmental system of tremendous economic and natural resource value due to its combination of diverse topographic, geologic, vegetative, and climatologic features. The Basin encompasses 300,000 square miles of which one-third is lake surface. Approximately 179,000 square miles or roughly 59 percent of the drainage basin lies within the boundaries of the United States.

The varied and irregular topography of the Basin offers a broad spectrum of diverse and significant features. Its thousands of natural lakes and streams and the five Great Lakes have served as a backdrop for important historical and cultural events. Because of the rich soils and gentle topographical relief, the Basin's wide, flat prairies, grasslands, and forests have supported agricultural and industrial development. The northern portions of the Lake Michigan and Lake Huron basins and the basins of Lake Superior and Lake Ontario contain the more scenic landscape patterns, particularly where there are bluffs and other strongly developed relief. Notable examples are New York's Adirondacks, the northlands of Wisconsin and Minnesota, and the Upper Peninsula and northern portion of the Lower Peninsula of Michigan.

During the Pleistocene era a series of four glacial ice sheets spread southward across the continent forming the Great Lakes, their tributaries, and thousands of small inland lakes. Scouring action, deposition, and pre-glacial northward flowing streams produced the lake-dotted Adirondack and Finger Lakes regions of the Lake Ontario basin As the glaciers melted, rich prairie and forest soils were deposited in the southern portion of the Great Lakes Basin. The resulting glacial moraines, river valleys, rock-strewn hills, bluffs, inland lakes, and streams are major focal points for outdoor recreation and study. To better understand these glacial features, the Ice Age National Scientific Reserve has been established in Wisconsin.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

To determine the areas of critical environmental concern for the National Assessment by Aggregated Subarea (ASA), the following methodology was used.

1. The selection of Areas of Critical Environmental Concern for consideration for preservation, protection or enhancement was guided by three major factors.

   A. The areas to be selected were to be a water-related recreation resource.

   B. Areas selected were to be considered of at least regional significance.

   C. Sufficient documentation was available from existing reports, plans, etc., to justify selection of areas.

2 A separate identification number was given to each area selected and the number was shown on maps to be distributed by WRC.

3. The following information on Areas of Critical Environmental Concern was collected and has been displayed in the following table.

A ASA - the Aggregated Subarea number.

B. Number - the number of the area in the table which corresponds to the number of the area shown on the maps for cross-reference.

C State - State in which the area is located.

D. Source - Informational sources which were used for selecting areas are shown by a number which is keyed to the references in footnote 2. Information was generally obtained from Statewide Comprehensive Outdoor Recreation Plans, Framework Studies (Level A), River Basin Studies (Level B), and other Federal and State publications.

E Name - the name of an area which was obtained from source documents

F Size - the size of areas which was obtained from source documents.

G. Attribute - The attribute(s) of areas selected which are shown by a Roman Numeral and keyed to attributes described in footnote 3. Attributes generally identified specific types of resources such as rivers, beach areas, floodplain recreation areas, springs, etc.

H. Concern - The concern(s) of areas selected (existing or potential) which are shown by a letter which is keyed to the explanation of the nature of concern found in footnote 4 Concerns generally identified specific concerns that threatened the preservation, protection, or enhancement of the resources such as land use development activities, water projects, or biological problems of water areas.

An additional listing of unique, scenic, or natural areas can be found in Tables 17-22 through 17-29 in Appendix 17, Wildlife, of the Great Lakes Basin Framework Study.

FORESTS

The natural vegetative cover of the Great Lakes Basin has been greatly altered by man's activities With the exception of small areas within the northwoods country of Michigan, Wisconsin, and northern Minnesota, virgin forests, which once dominated the Great Lakes Basin, are today nearly nonexistent. From Lake Ontario westward to southeastern Michigan, vegetation is dominated by broadleaf deciduous trees like oaks, hickories, and maples and includes approximately fifty other species of plant life. To the south and west of Lake Michigan, the natural prairie grasslands

Areas of Critical Environmental Concern

Great Lakes Region

ASA	Number 1/	State	Source 2/	Name	Size	Descriptor	
						Attribute 3/	Concern 4/
01	1	MI	2, 3	Potagannissing Bay Islands	2,462 acres	V	A,L,P
01	2	MI	3	Munuscong Lake Islands	1,356 acres	V	A,L,P
01	3	MI	3	Neebish & Sugar Island in Lake Nicolet	44,037 acres	V	A,L,P
01	4	MI	7	Tahquamenon River	60 miles	III	
01	5	MI	1	Betsy Lake-Tahquamenon Falls	2,692 acres	V	
01	6	MI	7	Two Hearted River		II	
01	7	MI	1	Pictured Rocks National Lake-Shore		V, VII, VIII	
01	8	MI	7	Cusino Lake Center Area		V	
01	9	MI	3	Lake Superior Islands in Michigan	14,365 acres	V	A,L,P
01	10	MI	7	Escanaba River	85 miles	III	
01	11	MI	1	Lake Superior Shore		VII	
01	12	MI	2	McCormick Tract	17,000 acres	VII	
01	13	MI	7	Sturgeon River	70 miles	III	
01	14	MI	7	Ontonagon River	70 miles	III	
01	15	MI	1	Imp Lakes Natural Area		V	
01	16	MI	1	Virgin Cedar Swamps	283 acres	V	
01	17	MI	2	Sylvania Tract	18,000 acres	VII	
01	18	MI	7	Presque Isle		III	
01	19	MI	1	Numerous Lakes		VIII	
01	20	WI	3	The Big Island in Flambeau Flowage	1,994 acres	V	
01	21	WI	1	Numerous Lakes		VIII	
01	22	WI	3	Lake Superior Islands in Wisconsin	48,567 acres	V	
01	23	WI	2	Apostle Islands National Lakeshore		V,VII	
01	24	WI	1	Kakagon Slough		V	
01	25	WI	2	Bad River Falls		V	
01	26	WI	1	Bark Bay		IV	
01	27	WI	2	Amnicon Falls	1,200 acres	V	
01	28	WI	1	Brule River		II, V	
01	29	MN	3	Lake Superior Islands in Minnesota	420 acres	V	
01	30	MN	1	Caribou River		V	
01	31	MN	1	Baptism River		V	
01	32	MN	1	Boundary Waters Canoe Area	873,000 acres	V, VII, VIII	E,R
01	33	MN	1	Gooseberry River		V	
01	34	MN	3	Islands of St Louis County Lakes	7,249 acres	V	
01	35	MN	1	Cloquet River		II, V	
01	36	MN	1	St Louis River		II, V	
01	37	MN	1	Lake Vermillion & Others		VII	A,P
01	38	MN	1	Vermillion River	38 miles	III	D,E,P
01	39	MN	2	Kabetogoma Peninsula Kabetogoma, Namakan and Rainy Lakes	75,000 acres	VIII	
02	1	WI	7	Paint River	70 miles	III	
02	2	WI	7	Fence River	45 miles	III	
02	3	WI	7	Pine River	55 miles	II	A,B,P
02	4	WI	1	Numerous Lakes		VIII	
02	5	WI	1	Popple River		II	A,B,P
02	6	WI	1	Pike River		II	
02	7	WI	6	Miscauno Cedar Swamp	150 acres	V	
02	8	WI	7	White Fish River	50 miles	III	

Areas of Critical Environmental Concern

Great Lakes Region

ASA	Number 1/	State	Source 2/	Name	Size	Descriptor	
						Attribute 3/	Concern 4/
02	9	WI	1	Laughing Whitefish Falls	360 acres	V	
02	10	WI	1	White Potato Lake		VIII	
02	11	WI	1	Noquebay Lake		VIII	
02	12	WI	1	Door County Peninsula		IV, VII, VIII	A
02	13	WI	3	Green Bay Islands	19,477 acres	V	A
02	14	WI	1	Door County Islands		V	A
02	15	WI	1	Jackson Harbor		VII	
02	16	WI	1	Wolf River		I, II	A
02	17	WI	1	Oconto River		III	A,B,C,H
02	18	WI	1	Green Bay Shoreland		IV	
02	19	WI	1	Shawano Lake		VIII	A
02	20	WI	7	Fox River	55 miles	III	
02	21	WI	1	Lake Michigan Shore		IV, VIII	A,E,P
02	22	WI	1	Lost Lake		VIII	
02	23	WI	1	Sand Country Lakes Area		VIII	
02	24	WI	1	Muir Lake		VII	
02	25	WI	1	Green Lake, Spring Lake, Lake Maria		VIII	
02	26	WI	1	Grand & White River Marshes		V	
02	27	WI	1	Sand County Lakes Area		VIII	
02	28	WI	1	Lake Winnebago & Related Area		VIII	A,J,P
02	29	WI	1	Rhine Center Bog		V	
03	1	WI	6	Cedarburg Bog	1,012 acres	V	
03	2	WI	1	SE Wisconsin Lakes Complex		VIII	A,J,P
03	3	WI	1	Kettle Moraine State Forest		VIII	A
03	4	WI	1	Lulu Lake & Bluff Creek Springs		VIII	A,J
03	5	WI	1	Lake Geneva-Yukwonago		VII, VIII	A,J
03	6	WI	2	Silver and Hooker Lakes	550 acres	VIII	A,J
03	7	WI	2	Bong Wildlife Area	4,538 acres	V	
03	8	IL	1	Northern Grass Lake Marsh Area	3,850 acres	V	
03	9	IL	1	Spring Lake	560 acres	VIII	A,J
03	10	IL	2	Wauconda Marshes	1,600 acres	V	
03	11	IL	2	Sullivan & Fish Lake Area	4,100 acres	V	A,J
03	12	IL	2	McHenry Fox River Marshes	7,000 acres	V	A,J
03	13	IL	4	Valo Bog		V	A,J
03	14	IL	2	Upper Persons & Mill Creek Area	7,000 acres	V	A
03	15	IL	2	Lake Michigan Shorelands		IV,VII,VIII	A,E,J
03	16	IL	2	Des Plaines River Bluffs	9,600 acres	VII	A
03	17	IL	1	Cranberry Slough	400 acres	V	
03	18	IN	1	Mt Pleasant Swamp	45 acres	V	
03	19	IN	4	Cowles Bog		V	
03	20	IN	4	Pinnook Bog	170 acres	V	
03	21	IN	7	Little Calumet River		III	A,C,J
03	22	IN	5	Indiana Dunes Lakeshore	5,120 acres	IV,V,VIII	A,B,E,P
03	23	IN	1	Shoemaker Bog	50 acres	V	
04	1	MI	7	Fox River		III	A,J
04	2	MI	7	Indian River	48 miles	III	
04	3	MI	2	Lake Michigan Shore		IV,VII,VIII	A,E,L
04	4	MI	1	Big Stone Cecil Bay	1,520 acres	IV	
04	5	MI	1	Sturgeon Bay-Sucker Creek	550 acres	IV	
04	6	MI	3	Lake Michigan Islands in Michigan	69,738 acres	V	
04	7	MI		Cathead Bay Area		IV,V	
04	8	MI	1	Deer Lake		V	

Areas of Critical Environmental Concern

Great Lakes Region

ASA	Number 1/	State	Source 2/	Name	Size	Descriptor	
						Attribute 3/	Concern 4/
04	9	MI	1	Eagle Harbor Bog		V	
04	10	MI	1	Lelanau Township Cedar Swamp		V	A
04	11	MI	1	Sleeping Bear Dunes		V	A,L
04	12	MI	1	Lac La Belle		V	A
04	13	MI	1	Managanese Falls-Gorge		V	
04	14	MI	1	Black Spruce Bog	40 acres	V	
04	15	MI	1	Grass Lake	89 acres	V	A
04	16	MI	7	Jordan River		II	
04	17	MI	1	Skegemog Marsh		V	
04	18	MI	7	Boardman River		III	
04	19	MI	7	Betsie River		II	
04	20	MI	7	Manistee	130 miles	III	
04	21	MI	2	Lake Michigan Shore		IV,V,VII,VIII	A,E,J,L
04	22	MI	7	Little Manistee River	65 miles	III	
04	23	MI	7	Pine River		III	
04	24	MI	1	Luther Baldwin Swamp		V	
04	25	MI	7	Pere Marquette		III	
04	26	MI	1	Dead Stream Swamp		V	
04	27	MI	1	Bog Lake		V	A
04	28	MI	7	White River		III	
04	29	MI	7	Muskegon River		III	
04	30	MI	7	Rouge River		II	
04	31	MI	7	Flat River		III	
04	32	MI	7	Fish Creek		III	
04	33	MI	7	Grand River		III	
04	34	MI	7	Thornapple River		III	
04	35	MI	7	Kalamazoo River		III	
04	36	MI	1	Black Spruce Bog	40 acres	V	
04	37	MI	7	Paw Paw River		III	
04	38	MI	1	Fort Custer Area		VI,VIII	
04	39	MI	4	Grand Mere Lakes		IV,VIII	A,J
04	40	MI	1	Warren Dunes Area	632 acres	IV,VIII	
04	41	MI	1	Galien River Swampland		V	
04	42	MI	7	Dowagiac River		III	
04	43	IN	1	Spicer Lake	30 acres	VII	A,J
04	44	IN	1	New Oak Road Bogs	80 acres	V	
04	45	IN	1	Koontz Lake	105 acres	VII	A
04	46	IN	7	St Joseph River		III	
04	47	IN	1	Quog Lake	100 acres	VII	A
04	48	IN	1	Olin Lake and Browand Woods	180 acres	VII	
04	49	IN	1	Tamarack Bog Nature Preserve	65 acres	V	
04	50	IN	1	Beaverdam Lake	55 acres	VII	A
04	51	IN	1	Marsh Lake	70 acres	V	A
04	52	IN	1	Barnes Swamp	125 acres	V	
04	53	IN	1	Long Swamp Woods and Pond	40 acres	V	
04	54	IN	7	Elkhart River	13 miles	III	
05	1	MI	1	Ochsner Lake Bog		V	
05	2	MI	2	Lake Huron Shore		IV,VIII	A
05	3	MI	7	Black River		III	
05	4	MI	3	Grand Lake Islands	328 acres	V	
05	5	MI	7	Thunderbay River		III	
05	6	MI	1	Alpena Sinkholes		V	
05	7	MI	7	Au Sable River		III	
05	8	MI	1	Lost Lake	80 acres	V	A
05	9	MI	1	Tobico Marsh		V	
05	10	MI	7	Cass River		III	
05	11	MI	1	Seven Ponds Nature Center	245 acres	VIII	

Areas of Critical Environmental Concern

Great Lakes Region

ASA	Number 1/	State	Source 2/	Name	Size	Descriptor	
						Attribute 3/	Concern 4/
05	12	MI	3	Lake Huron Islands in Michigan	33,395 acres	V	A
05	13	MI	7	Shiawasee River		III	
06	1	MI	2	Lake Huron Shore		IV,VIII	A
06	2	MI	1	McKail Woods		V	
06	3	MI	1	Fish Lake Bog		V	
06	4	MI	1	Timberland & Lakeville Swamps	226 acres	V	
06	5	MI	1	Metropolitan Beach Marsh		V	
06	6	MI	1	Chamberlain Lakes		V	A,J
06	7	MI	1	Proud Lake & Bog Area	105 acres	V	A,J
06	8	MI	1	Mud Lake Bog	754 acres	V	A,J
06	9	MI	1	Mattheie Botanical Gardens		V	
06	10	MI	7	Huron River, Michigan		III	A,J
06	11	MI	3	Detroit River Islands	200 acres	V	
06	12	MI	1	Point Mouillee State Game Area		V	J
06	13	OH	2	Lake LaSuAn	900 acres	IV,VII	A
06	14	OH	7	St Joseph River	72 miles	III	J
06	15	OH	7	Tiffin River	35 miles	III	H,J,K
06	16	OH	7	Maumee	105 miles	II	A,J,K
06	17	OH	1	Miami and Erie Canal		VIII	D
06	18	OH	1	Fox Island Nature Preserve	220 acres	V	
06	19	OH	1	Grand Lake St Marys		VIII	A,J,K
06	20	OH	1	Irwin Prairie		V	A
06	21	OH	2	Lake Erie Shore		IV, VIII	A,J,L
06	22	OH	2	Bass Islands in Lake Erie	6,290 acres	V	
06	23	OH	7	Sugar Creek		III	
06	24	OH	7	Sandusky River	65 miles	II	
06	25	OH	1	Silver Creek		V	
06	26	OH	1	Sandusky Bay Wetlands		V	J,K
06	27	OH	4	Glacial Groove State Memorial		V	
06	28	OH	1	Bayview & Lake Erie Marshes		V	J,K
06	29	OH	1	Berlin Heights Ravine		V	
06	30	OH	7	Huron River	25 miles	III	A,J,K
06	31	OH	7	Vermillion River	25 miles	III	A,J,K
07	1	NY	2	Lake Ontario Shore		IV,V,VIII	A,C,J,L
07	2	NY	3	Niagara River Islands	18,467 acres	V	A
07	3	PA,NY	2	Lake Erie Shore(part of)		IV,V,VIII	A,C,J,L
07	4	PA	2	Presque Isle		IV,V,VII,VIII	L,I,O
07	5	OH	4	Mentor Marsh	850 acres	V	A,K
07	6	OH	7	Grand River	56 miles	II	
07	7	OH	4	Holden Natural Area		V	
07	8	OH	1	Cuyahoga River Marsh		V	J
07	9	OH	7	Cuyahoga River	25 miles	II,III	
07	10	OH	1	Parkman Gorge		V	
07	11	OH	1	Breakneck Creek Wetlands		V	
07	12	OH	1	Dollar Lake		V	A,J
07	13	OH	1	Singer Lake		V	A,J
07	14	OH	1	Streetsboro Bog		V	A,J
07	15	OH	1	532 Swamp		V	A,J
07	16	OH	1	Cranberry Bog		V	A,J
07	17	OH	1	Cuyahoga River Valley		V	A
07	18	OH	4	Tinkers Creek Gorge		V	
07	19	OH	7	Chagrin River	30 miles	III	
07	20	OH	1	Mentor Marsh		V	A,J
08	1	NY	3	Sols Island Group in Roquette River	187 acres	V	

Areas of Critical Environmental Concern

Great Lakes Region

ASA	Number 1/	State	Source 2/	Name	Size	Descriptor	
						Attribute 3/	Concern 4/
08	2	NY	3	Cedar Island Group in Chippewa Bay	120 acres	V	
08	3	NY	4	Ironsides Island		V	
08	4	NY	2	Thousand Islands		V	
08	5	NY	3	St Lawrence River Islands	18,269 acres	V	
08	6	NY	3	Black River Islands	184 acres	V	
08	7	NY	4	Dexter Marsh		V	
08	8	NY	3	Lake Ontario Islands in New York	2,794 acres	V	
08	9	NY	4	Lakeview Marsh & Barrier Beach		V	A,J
08	10	NY	3	Glosky Island in Oneida River	100 acres	V	
08	11	NY	2	Lake Ontario Shore		IV,VIII	A,J,L
08	12	NY	3	Seneca River Islands	524 acres	V	A
08	13	NY	4	Round Lake		VII	A,J
08	14	NY	4	McLean Bogs		V	
08	15	NY	4	Montezuma Marshes		V	
08	16	NY	4	Zurick Bog		V	
08	17	NY	3	Newark Island Group in Sodus Bay	207 acres	V	
08	18	NY	4	Mendon Ponds		V	
08	19	NY	4	Burgen-Bryon		V	
08	20	NY	4	Oak Orchard - Marsh		V	
08	21	NY	4	Fossil Coral Reef		V	
08	22	NY	4	Moss Lake Bog		V	

1/ Numbers are keyed to maps of Areas of Critical Environmental Concern which will be available from WRC at a later date

2/ Keyed Items Indicating Sources of Information

1 Respective Statewide Comprehensive Outdoor Recreation Plans
2 Great Lakes Basin Framework Study or River Basin (Level B) studies covering area
3 Islands of America, Bureau of Outdoor Recreation, 1970
4 National Register of Natural Landmarks, Federal Register Vol 38, No 171, September 5, 1973
5 Indiana Dunes National Lakeshore Project, National Park Service, 1967
6 Wisconsin Scientific Areas, Scientific Areas Preservation Council, Wisconsin Department of Natural Resources, 1973
7 Bureau of Outdoor Recreation, Unpublished Reports and Studies
8 Northeast Michigan Regional Planning and Development Commission
9 Milton J Shapp, Governor of Pennsylvania

3/ Keyed Items Describing the Attributes of Areas of Critical Environmental Concern

I Federal Wild and/or Scenic River (Pursuant to Section 3(a), P L 90-542, as amended by P L 93-621)
II State Wild and/or Scenic River (Pursuant to State Legislation)
III Potential Wild and/or Scenic River (Pursuant to Sections 5(a) or 5(d) of P L 90-542, as amended by P L 93-621, SCORP's, Framework Level A and River Basin Level B studies)
IV High Value Recreation Beach or Shoreland
V Unique Water or Water Related Recreation Area, such as Waterfall, Spring, Gorge, Canyon, Wetland (March, Swamp, or Bog), Island (High value recreation and of a fragile environmental nature), Scientific Water Related Study Area
VI Flood Plain Recreation Area
VII Open Space, Scenic or Natural Area
VIII High Value General Recreation Area

4/ Keyed Items Describing the Nature of Concern (Existing or Potential) of Areas of Critical Environmental Concern

A Residential Development
B Commercial Development
C Industrial Development
D Agricultural Development
E Mining and Related Energy Resource Development
F Dams and Irrigation Projects
G Navigation Projects
H Channelization Projects
I Water Level Fluctuations
J Water Pollution
K Sedimentation
L Erosion
M Nuisance Vegetation
N Weed Growth
O Eutrophication
P Adequate Public Access
Q Adequate Stream Flows
R Over Use (Recreation)

Additional Areas of Critical Environmental Concern
Suggested by the Public Review Group

Great Lakes Region

ASA	Number 1/	State	Source 2/	Name	Size	Descriptor	
						Attribute 3/	Concern 4/
05		MI	8	Cheboygan Marsh-Duncan Bay		V,VII	
05		MI	8	El Cajon Bay "Sink Holes"		V,VII	
05		MI	8	Lake Huron Wetlands (Alpena Co)		V,VII	
05		MI	8	Thunder Bay River		VII	
07		PA	9	Presque Isle Bay		V	J

and open forests have been altered for agricultural and residential use. Much of northern Wisconsin, the Upper Peninsula of Michigan, and the northern half of the Lower Peninsula of Michigan are now characterized by second growth coniferous and mixed hardwood forests. Throughout much of the north country the vegetation is a mixture of maple, hemlock and pine. Spruce-fir, white-red-jack pine, and aspen-birch forest types give way to oak-hickory and maple-beech-birch forest types as one proceeds southward in the Basin. The following map shows the concentration of National and State forests in the Minnesota, Wisconsin, Michigan, and New York portions of the Basin. Following is a list of the Region's National Forests by ASA.

ASA 01
Superior National Forest
Chequamegon National Forest
Ottawa National Forest
Hiawatha National Forest

ASA 02
Nicolet National Forest

ASA 04
Hiawatha National Forest
Manistee National Forest

ASA 05
Huron National Forest

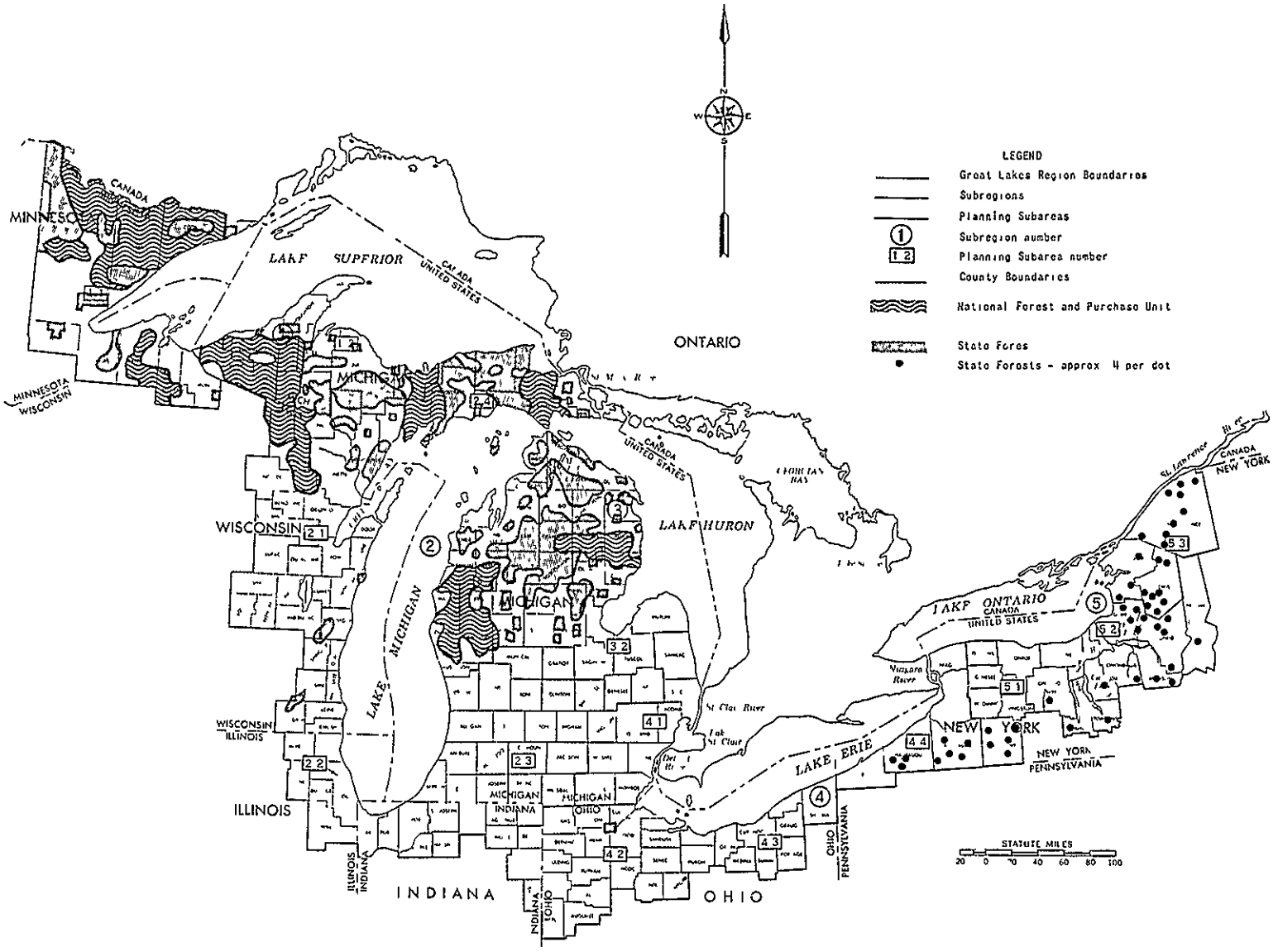
WILD AND SCENIC RIVERS

NATIONAL WILD AND SCENIC RIVERS

Two states in the Great Lakes Region currently have rivers included or under study for inclusion in the National Wild and Scenic Rivers System. The Wolf River in Wisconsin, from the Landglade-Menominee County line downstream to Keshena Falls, was designated a wild and scenic river in the Wild and Scenic Rivers Act of 1968. In Michigan, the AuSable and Manistee Rivers are being studied, while the study of the Pere Marquette River has been completed and final recommendations are pending.

STATE WILD, SCENIC, AND RECREATIONAL RIVERS

As of 1975, all of the states in the Great Lakes Basin, except for Illinois, have established programs for designating state rivers and streams wild, scenic, or recreational. The status of each of the State programs is presented here Basin maps showing the rivers and their classifications follow. New York's designations are presented on a map provided by that state because of its greater detail and the limited scale of many of New York's designations. Descriptions of the precise locations of the stream segments are not presented here but can be obtained from the respective state natural resource agencies.


LEGEND
Great Lakes Region Boundaries
Subregions
Planning Subareas
Subregion number
Planning Subarea number
County Boundaries
National Forest and Purchase Unit
State Fores
State Forests - approx 4 per dot
LAKE SUPERIOR
CANADA
UNITED STATES
ONTARIO
MINNESOTA
WISCONSIN
MICHIGAN
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
NEW YORK
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
WISCONSIN
ILLINOIS
ILLINOIS
INDIANA
INDIANA
OHIO
OHIO
PENNSYLVANIA
NEW YORK
PENNSYLVANIA
MICHIGAN
INDIANA
MICHIGAN
OHIO
St. Clair River
Lake St. Clair
Niagara River
St. Lawrence
CANADA
NEW YORK
STATUTE MILES
20 0 20 40 60 80 100

Minnesota — Minnesota's rivers are classified as wild, scenic, or recreational.

Proposed for Study
1. St Louis
2 Cloquet

Wisconsin· Wisconsin's rivers are designated as wild rivers

Designated Rivers
1. Pine River
2. Popple River
3. Pike River

Although not designated as wild rivers, the Brule River (Douglas County) and the upper Wolf River (Langlade County) receive management as stringent or more stringent.

Michigan — Michigan's rivers are classified as wilderness, wild-scenic, or country-scenic.

Designated Natural Rivers
1. Two-Hearted River - wilderness river (Luce County)
2 Jordan River - wild-scenic river (Charlevoix and Antrim Counties)
3. Betsie River - wild-scenic river (Manistee, Benzie, and Grand Traverse Counties)
4 Rogue River - county-scenic river (Kent County)
5. White River - wild-scenic river (Oceana, Muskegon, and Newaygo Counties)
6 Boardman River - wild-scenic river (Grand Traverse and Kalkaska Counties)

Rivers Under Study for Designation
1 Indian
2. Fence
3. Black
4 Little Manistee
5. Muskegon
6 Kalamazoo
7 Huron (Lower Peninsula)
8. Whitefish
9 Fox
10. Pigeon
11. Flat
12. Thornapple
13 Shiawassee
14 Paw Paw

Proposed for Study
1 Presque Isle
2. Ontonagon
3 Paint
4 Huron (Upper Peninsula)
5. Rifle
6. Sturgeon
7. Fish Creek
8 Escanaba
9. Tahquamenon
10. Thunderbay
11 Cass

12. Grand
13 Dowagiac
14. St. Joseph

Illinois Illinois does not presently have a natural rivers program

Indiana Indiana's rivers are classified as natural, scenic, or recreational.

Proposed for Study
1 Little Calumet River (Porter County)
2. Elkhart River (Noble County)

Designated Recreational
1. Cedar Creek (Allen and DeKalb Counties)

Ohio Ohio's program classifies rivers as wild, scenic, or a combination of both (eg., wild-scenic).

Designated Scenic
1 Sandusky River (Sandusky, Seneca, and Wyandotte Counties), approximately 65 miles
2 Grand River (Ashtabula County), approximately 33 miles
3. Cuyahoga River (Geauga and Portage Counties), approximately 25 miles
4. Maumee River (Paulding and Defiance Counties), approximately 53 miles

Designated Wild
1. Grand River (Lake County), approximately 23 miles

Designated Recreational
1. Maumee River (Henry, Defiance, and Wood Counties), approximately 43 miles

Pending Designation
1 Cuyahoga River (Geauga County), approximately 7 miles

Proposed for Study
1. Vermilion River (Huron and Erie Counties)
2 St Joseph River (Defiance and Williams Counties)
3. Tiffin River (Defiance, Williams, and Fulton Counties)
4. Huron River (Huron and Erie Counties)
5. Chagrin River (Portage, Cuyahoga, Geauga, and Lake Counties)
6. Cuyahoga River (Between Akron and Cleveland)
7. Sugar Creek (Ottawa and Sandusky Counties)
8. Sandusky River (Wyandotte County)

Pennsylvania· Pennsylvania classifies its rivers as wild, scenic, recreational, and modified recreational Streams in the Lake Erie drainage which have been recommended for inclusion in the State's Scenic Rivers Program are (1) Walnut Creek, (2) Elk Creek and Little Elk Creek, and (3) Conneaut Creek.

New York New York's rivers are classified as wild, scenic, or recreational.

Designated Wild
1. Oswegatchie River (St. Lawrence and Herkimer Counties)
Main Branch - approximately 18 1/2 miles
Middle Branch - approximately 14 1/2 miles

2. Cold River (Franklin and Essex Counties) - approximately 14 miles
3. Indian River (Hamilton County) - approximately 13 miles
4 Oluska Pass Brook (Franklin and Essex Counties) - approximately 3 miles

Designated Scenic

1. Bog River (St. Lawrence County), approximately 7 3/10 miles
2 Deer River (Franklin County), approximately 6 2/10 miles
3. Grasse River (St. Lawrence County)
   Middle Branch - approximately 25 4/10 miles
   North Branch - approximately 25 4/10 miles
   South Branch - two segments of approximately 35 2/10 miles and 3 7/10 miles.
4 Blue Mountain Stream (St. Lawrence County), approximately 9 miles
5. Jordan River (St. Lawrence and Franklin Counties), approximately 18 miles
6 Long Pond outlet (St Lawrence and Franklin Counties), approximately 16 miles
7. Moose River (Lewis and Herkimer Counties)
   Main Branch - approximately 15 4/5 miles
8. Oswegatchie River (Lewis and Herkimer Counties)
   Middle Branch - two segments of approximately 9 miles and 14 2/5 miles
   West Branch - approximately 7 miles
9. St Regis River
   East Branch (Franklin County) - approximately 14 1/2 miles
   Main Branch (Franklin County) - approximately 15 1/2 miles
   West Branch (St. Lawrence and Franklin Counties), approximately 35 miles
10 Ampersand Brook (Franklin County), approximately 8 miles
11 Black River (Herkimer County) - approximately 7 8/10 miles
12 Independence River (Herkimer and Lewis Counties) - approximately 26 miles
13. Marion River (Hamilton County) - approximately 5 miles
14 Moose River (Herkimer and Hamilton Counties)
   South Branch, three segments of approximately 14 2/5 miles, 18 miles, and 6 1/2 miles
15 Otter Brook (Hamilton County) - approximately 10 miles
16 Raquette River (Hamilton, Franklin, and St. Lawrence Counties), two segments of approximately 20 miles and 13 8/10 miles
17. Red River (Hamilton County) - approximately 9 7/10 miles
18 Round Lake Outlet (Hamilton County) - approximately 2 7/10 miles

Designated Recreational

1. Grasse River (St. Lawrence County)
   South Branch - approximately 5 1/5 miles
2 Oswegatchie River
   Main Branch (St. Lawrence County) - approximately 2 3/10 miles
   West Branch (Lewis County) - approximately 6 1/10 miles
3. St. Regis River
   East Branch (Franklin County) - approximately 6 1/10 miles
   Main Branch (Franklin County) - two segments of approximately 7 miles and 18 miles
   West Branch (St. Lawrence County) - approximately 5 1/2 miles
4 Salmon River (Franklin County), approximately 12 3/10 miles

5 Moose River (Hamilton County)
South Branch - approximately 15 miles
6 Black River (Herkimer County) - approximately 6 3/5 miles
7 Independence River (lewis County) - approximately 1/2 mile
8 Raquette River (Hamilton, Franklin, and St Lawrence Counties), two segments of approximately 22 miles and 17 miles

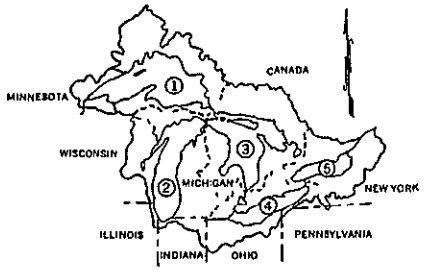
Study Rivers

1 Grasse River (St Lawrence County), approximately 25 miles of the Main Branch
2 Osgood River (Franklin County), approximately 14 miles
3. Oswegatchie River (St Lawrence County), approximately 11 miles of the Main Branch
4. Pleasant Lake Stream (St Lawrence County), approximately 7 miles
5 Genesee River (Allegany County), from the Pennsylvania State line to Letchworth State Park
6. Moose River (Herkimer County)
North Branch - approximately 19 miles
Middle Branch - approximately 13 1/2 miles

1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

LAKE SUPERIOR



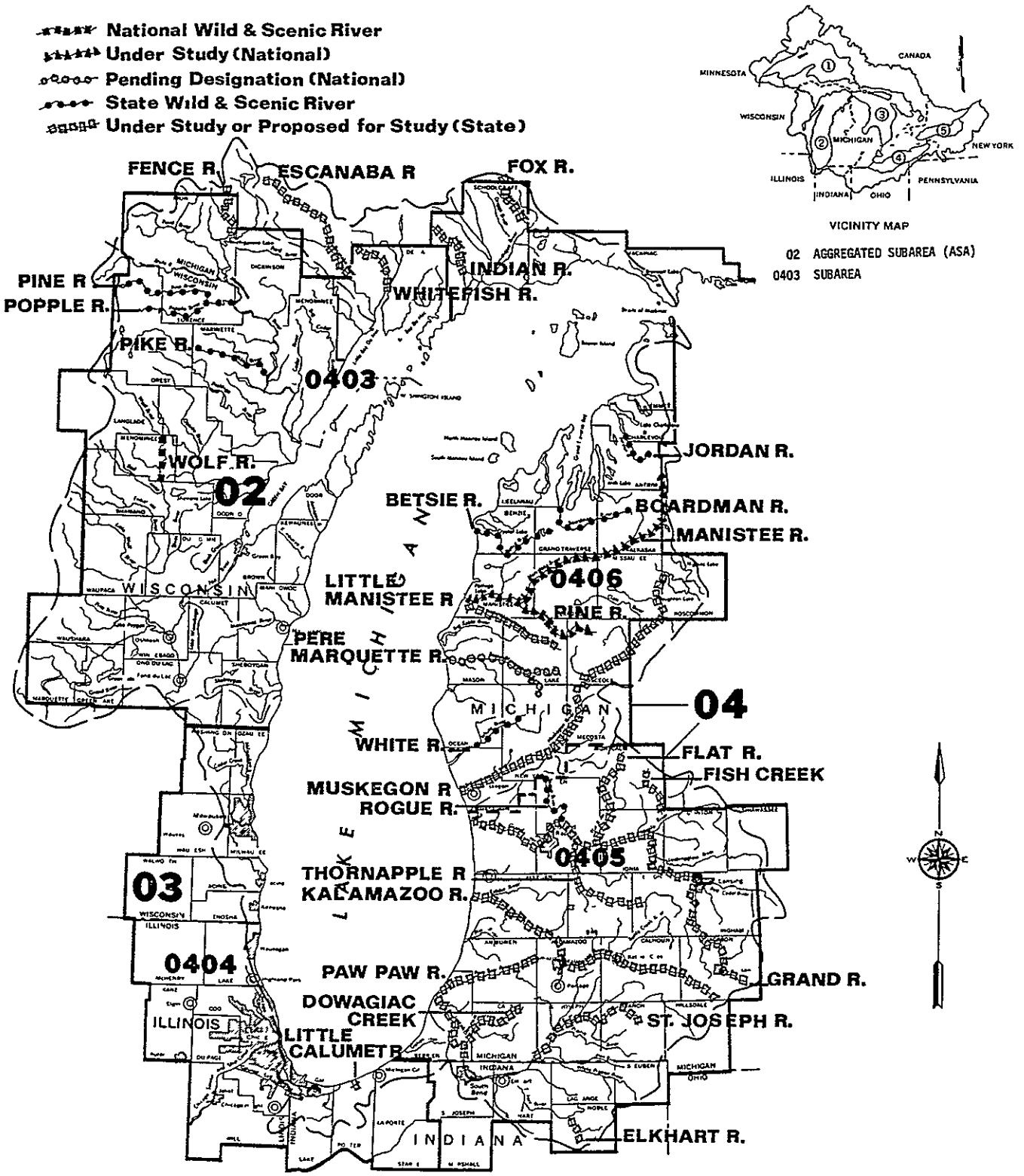
VICINITY MAP

01 AGGREGATED SUBAREA (ASA)

0401 SUBAREA

State Wild & Scenic River

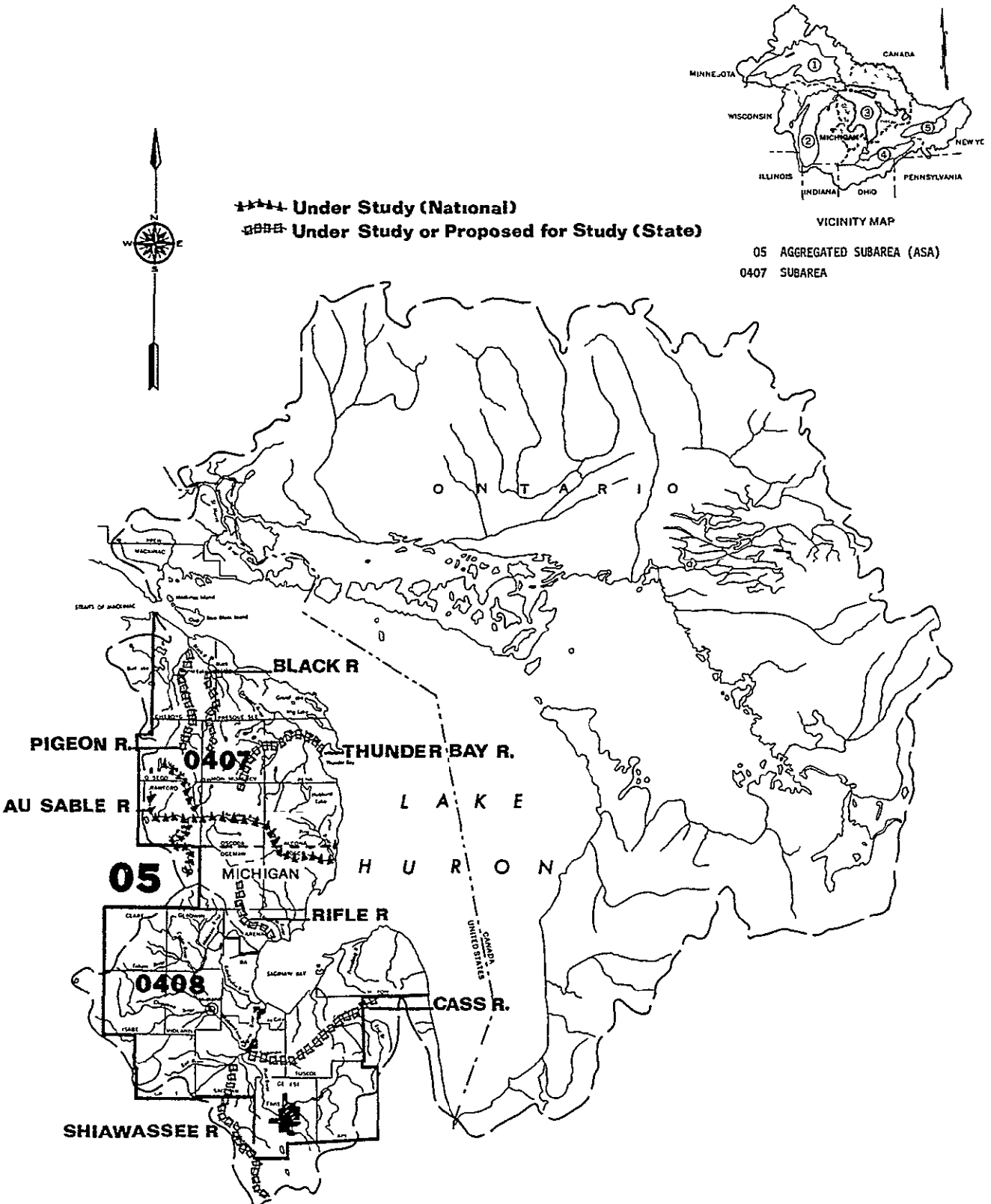
Under Study or Proposed for Study (State)



1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

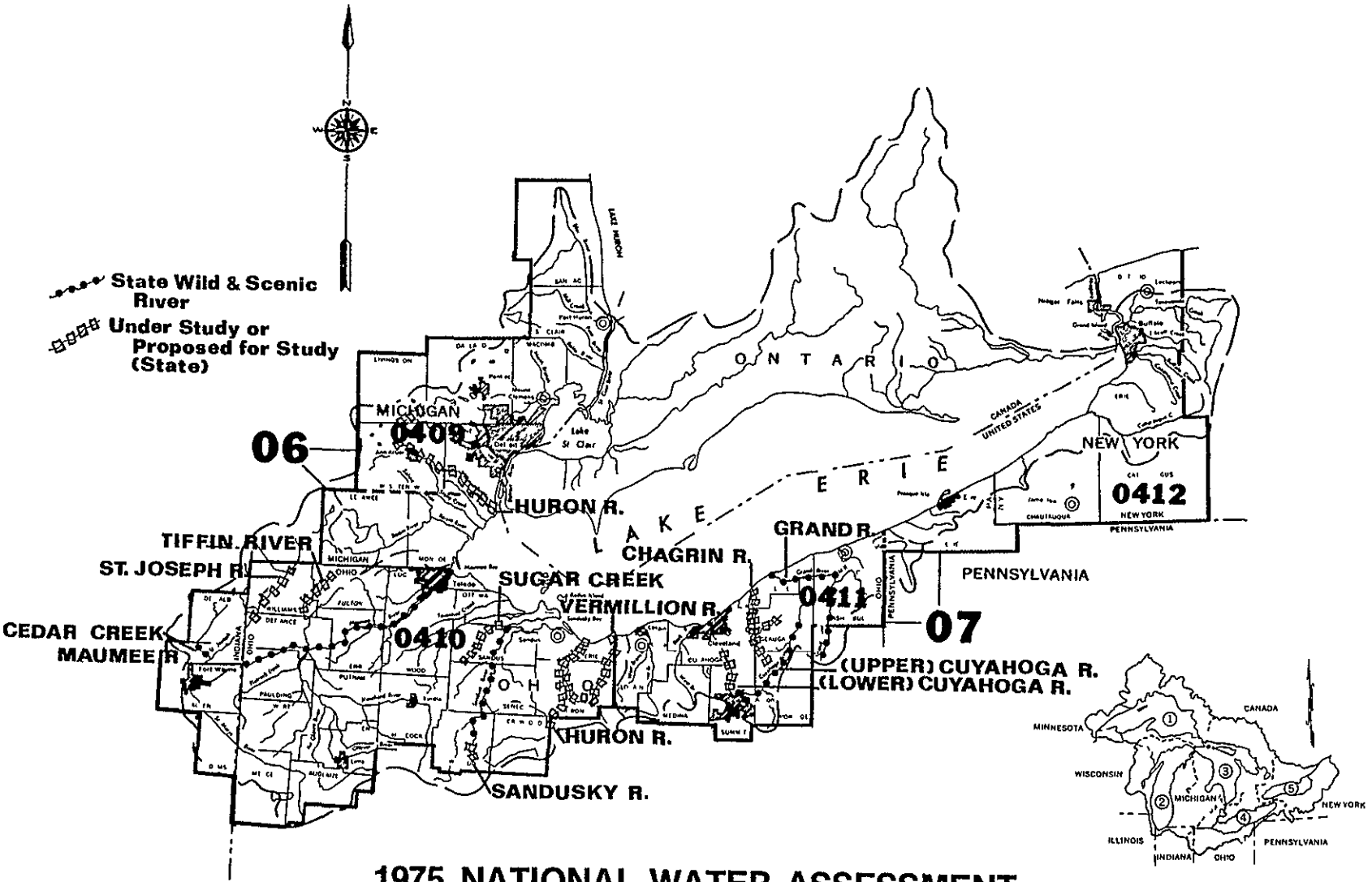
LAKE MICHIGAN



1975 NATIONAL WATER ASSESSMENT

GREAT LAKES—REGION 4

LAKE HURON



1975 NATIONAL WATER ASSESSMENT

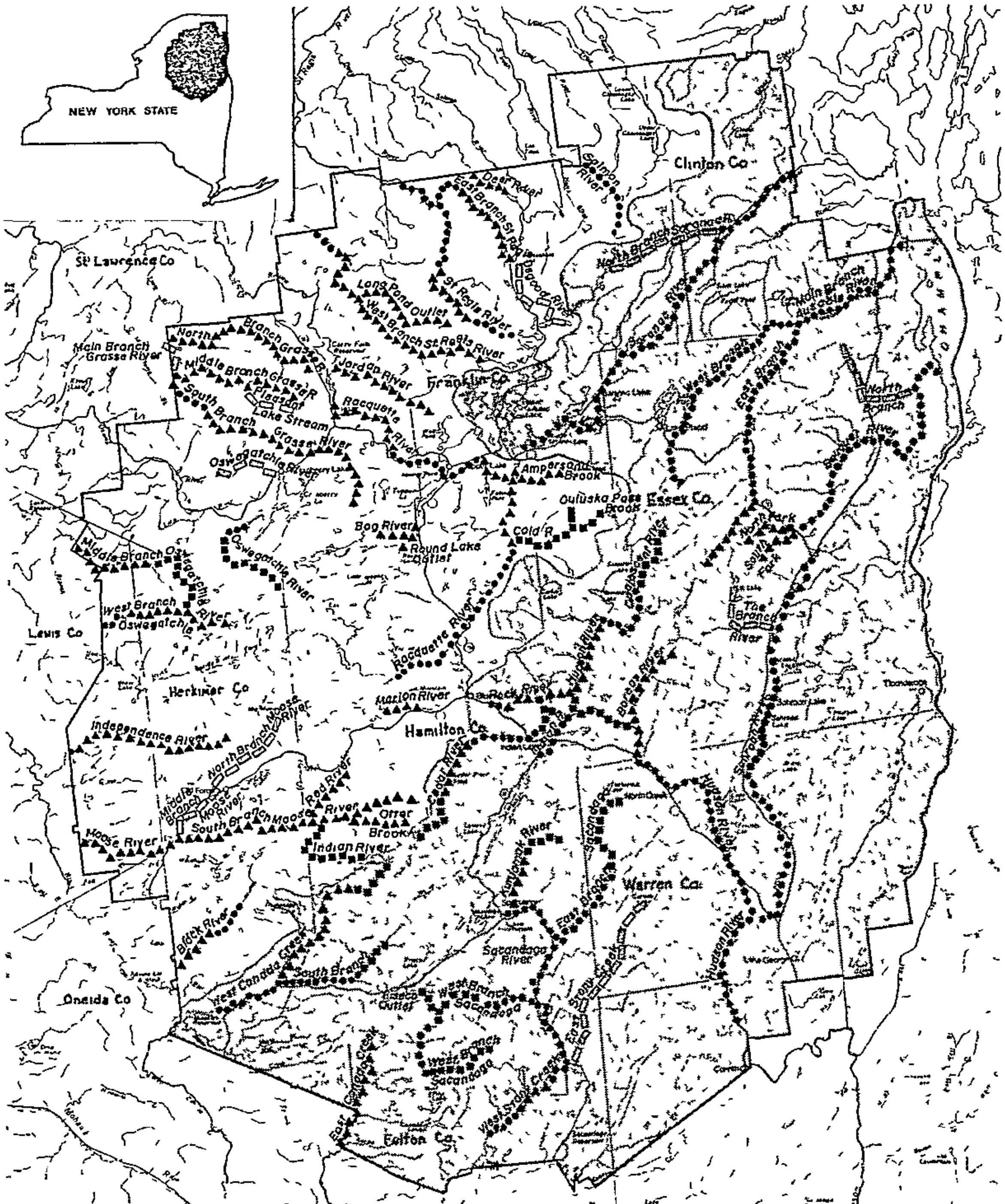
GREAT LAKES—REGION 4

LAKE ERIE

VICINITY MAP

06 AGGREGATED SUBAREA (ASA)
0409 SUBAREA

SCALE IN MILES
0 10 20 30 40 50



ADIRONDACK PARK PORTION
of the
NYS Wild, Scenic and Recreational Rivers System

DESIGNATED RIVERS

■ WILD

▲ SCENIC

● RECREATIONAL

STUDY RIVERS ▭

Adirondack Park Agency

Great Lakes Basin is unshaded area.

The Genesee River in Allegany Co is also a study river.

GREAT LAKES SHORELANDS

LAKE SUPERIOR AND THE ST. MARYS RIVER

Lake Superior, the largest and northernmost Great Lake, has the most rugged, uninhabited, and inaccessible shorelands of all the Great Lakes. Minnesota, Wisconsin, and Michigan all have jurisdiction over portions of Lake Superior's 912 miles of the United States mainland shoreline. The United States mainland shoreline of the St Marys River, which, for the purpose of this study, is considered to be the 91.2 miles from the Soo Locks to its confluence with Lake Huron near De Tour, Michigan, is entirely within the State of Michigan

Because of the lack of development and the high scenic quality of the Lake Superior shorelands, almost all of the shorelands are considered of prime recreational value Furthermore, the lack of industrial development and the low population of this northern region leaves the overall water quality of Lake Superior excellent. A few problems exist in isolated areas, primarily as a result of mining activities

Shoreland Description

The shore type of Lake Superior and the St Marys River varies from the steep rock cliffs of the Pictured Rocks National Lakeshore area, to the sandy beaches of Whitefish Bay, Michigan, to the low-lying clay and gravel bluffs near Duluth, Minnesota, and in Wisconsin, to the marshlands of Munuscong Bay, Michigan

Lake Superior and the St Marys River contain many major islands and island groups, which add greatly to the overall value of the shoreland resources of the region.

LAKE MICHIGAN

Lake Michigan's total shoreline length is 1,362 miles, parts of which are located in Wisconsin, Illinois, Indiana, and Michigan. Lake Michigan contains the largest embayments of any of the Great Lakes and has the least number of islands and island groups, all of which are located in the northern one-third of the lake.

Shoreland Description

The most impressive natural shore type of the Great Lakes is the large expanse of sand dunes along Lake Michigan's shore These dunes extent almost continuously from the Indiana Dunes National Lakeshore northward to the tip of the Leelanau Peninsula in Michigan. They result from the prevailing westerly winds that cause an almost continuous washing and separation of shore soil materials by wave action. Often associated with the dune areas, especially during years of low water levels on the Great Lakes, are wide, sandy beaches which are heavily used for recreation.

Vulnerable erodible bluff areas are found along many shoreland reaches. Often used as building sites because of their scenic views, the erodible bluffs are being continuously threatened and damaged by erosion The nonerodible bluff areas are basically limited to Michigan's Upper Peninsula portion of Lake Michigan and the northern portions of Door County, Wisconsin.

Valuable marshlands providing both cover and food for fish and wildlife are extensive in Green Bay and Big and Little Bays de Noc. The wetlands of Green Bay are most often associated with low plain backlands

With the exception of the Upper Peninsula of Michigan, some portions of northern Wisconsin, and Michigan's northern Lower Peninsula, Lake Michigan shorelands are used quite extensively for residential, commercial, industrial, and recreational developments and for agriculture.

LAKE HURON

Lake Huron, the second largest of the Great Lakes, is separated from Lake Michigan by the Straits of Mackinac. Lake Huron's United States shoreland, a total mainland length of 565 miles, is entirely within the State of Michigan, but the majority of the total shoreline, including Georgian Bay, is under the jurisdiction of the Canadian Province of Ontario

Other than Lake Superior, Lake Huron is the least developed of the Great Lakes. The water quality of the Lake is good except for an isolated problem in Saginaw Bay The prevailing westerly winds affect the recreational value of the Lake in that warm surface waters are blown eastward, which allows cool waters to surface along the western shore This limits swimming and other body contact water-oriented activities

The lake contains significant fishery and wildlife value, especially in the marshy Saginaw Bay area and the Les Cheneaux Island group. Saginaw Bay is the most significant fish and wildlife habitat area on the Great Lakes.

Lake Huron contains more islands than any of the other Great Lakes and many contribute a great deal to the overall value, use, and development of the lake.

Shoreland Description

Lake Huron's shore type is quite different from that of Lake Michigan and Lake Superior. It is mainly a rock and boulder shore in the northern area with some high bank beaches extending landward into a rolling upland area. Saginaw Bay is characterized by wetlands. From Sand Point in outer Saginaw Bay to the most northern part of Huron County, the shore is sandy beaches backed by low dunes and bluffs. This shore type also predominates in Sanilac County. From northern Huron County east and south approximately to the Huron-Sanilac County line exposed bedrock and very rocky shorelands replace the sandy shore type with a picturesque shoreline

LAKE ERIE, ST CLAIR RIVER, LAKE ST. CLAIR, THE DETROIT RIVER, AND THE NIAGARA RIVER

Lake Erie surpasses only Lake Ontario in size. Its United States and Canadian shores are only 58 miles apart at the widest point, and it has the shallowest maximum depth of all the Great Lakes, only 210 feet. The 30-foot depth contour is approximately one mile offshore all around the shoreline, which contributes to the great fluctuations in water level. These fluctuations are greater than those on any of the other Great Lakes. Strong winds flowing along the axis of the lake can create seiches that have been known to lower the water level at one end of the lake by eight feet or more, while the water depths of harbors at the other end of the lake rise several feet.

Michigan, Ohio, Pennsylvania, and New York have jurisdiction over the 342 miles of Lake Erie shorelands in the United States.

Shoreland Description

The United States shorelands of the St. Clair River, Lake St. Clair, and the Detroit River are all under the jurisdiction of the State of Michigan Abutting the most populated area of Michigan, they are the most heavily developed of all shorelands in the State. The 115-mile long waterway, which divides the so-called upper Great Lakes (Superior, Michigan, and Huron) from the lower Great Lakes (Erie and Ontario), is heavily used for navigation.

The State of Michigan has 32.5 miles, or 9 5 percent of the shorelands of Lake Erie, almost all of which are located in Monroe County. The shore types of this stretch of shoreline vary, but basically consist of wetlands interspersed with artificial shore types in and near the more developed areas.

Shore types along the Ohio shoreline range from the wetlands, low erodible bluffs, and erodible plain shore in the western one-third of the State to the high erodible glacial till and soft shale bluffs located in the eastern two-thirds of the State.

Erie County, Pennsylvania, has a shore frontage of 48.3 miles, the only Pennsylvania frontage on Lake Erie and the Great Lakes. Its shore bluffs are generally 50 to 75 feet high and rise to 100 feet in a few places. Sand and gravel beaches up to 150 feet wide extend along the toe of the bluffs.

The Lake Erie shores of New York's Chautauqua and Erie Counties measure 70.9 miles and are characterized by high erodible bluffs. The average height of the shore bluffs is 40 to 50 feet, but it extends to 100 feet in short reaches For some distance on either side of river mouths the bluffs are lower.

LAKE ONTARIO

Lake Ontario, the smallest of the Great Lakes, has the shortest shoreline within the United States. Lying entirely within the State of New York, it extends 289 6 miles from the mouth of the Niagara River to Tibbett's Point at the head of the St. Lawrence River.

New York's Lake Ontario shoreline is fairly regular, running in an east-west direction from the mouth of the Niagara River for approximately 160 miles The shoreline then diverts to a north-south direction, becoming irregular with several large bays in the northern half. Rochester is the major urban center located on Lake Ontario.

Shoreland Description

The east-west portion of the Lake Ontario shoreline consists generally of bluffs of glacial material ranging from 20 to 60 feet high Narrow gravel beaches border the bluffs, which are subject to erosion by wave action The bluffs are broken in several places by low marshes. The shore in the vicinity of Rochester and Irondequoit is marshy with sand and gravel barrier beaches separating the marshes and open ponds from the lake. The shoreline from Sodus Bay east to Port Ontario is a series of drumlins and dunes separated by marsh areas. North of the Oswego-Jefferson County line for a distance of 10 miles, the shorelands are composed of dunes and barrier beaches At this point, the shore type changes abruptly to rock outcrop at the water's edge. This rock shore extends north to the St. Lawrence River, interrupted only by a few pockets of beaches and marshes at the inner ends of the deep bays.

Detailed maps showing use, ownership, physical characteristics, and environmental values along all the Great Lakes shorelands may be found in Attachment B of Appendix 12, Shore Use and Erosion, of the Great Lakes Basin Framework Study

WETLANDS

Wetlands are the single most important type of wildlife habitat in the Great Lakes Basin Preservation of wetlands is important because of their role as habitat for fish and wildlife, in water quantity and quality regulation, as groundwater discharge and recharge areas, as recreation, education, and research areas, and in providing open space in urban areas. Wetlands are vulnerable to urban growth since they can be drained, diked, filled, or dredged and converted to other types of land or water use. Natural causes are also responsible for degradation and loss of wetlands Erosion by wind and water has caused great changes in Great Lakes coastal marshlands. Nevertheless, human activities pose the greatest threat to wetlands and it is in this area that future protection efforts should be directed

In 1953 and 1954, the U.S. Fish and Wildlife Service, working in cooperation with various State fish and game agencies, conducted a nationwide inventory of wetlands. This survey has been followed by various individual State wetlands appraisals. Because of variations in the coverages and time periods of these later studies, no uniform data are available on which to base an up-to-date assessment of wetlands for the entire Great Lakes Region. There was, however, a determination of the acres of coastal wetlands in the Great Lakes as of 1970, developed by the Bureau of Sport Fisheries and Wildlife as part of its activities for the International Joint Commission's Great Lakes studies. However, to correlate these data with the 1953-1954 studies would be nearly impossible. The U.S Fish and Wildlife Service is currently working on a new national inventory of wetlands The Great Lakes portion is expected to be accomplished by October, 1977.

Acres of Great Lakes Basin Coastal Wetlands of Significant Value to Fish and Wildlife (1970)

PSA	Reach and State	Acres
	Lake Ontario	
4 4	Niagara River outlet to Orleans-Monroe county line--N Y	None
5 1	Orleans-Monroe County line to Rochester --N Y	2,890
5 2	Monroe-Wayne County line to Sterling Creek outlet--N Y	2,670
	South Pond and Deer Creek Marsh to Sandy Creek outlet--N Y	10,635
	Total	13,305
5 3	Stony Creek outlet to Wilson Bay--N Y	4,311
	Black River Bay to Wilson Bay--N Y	2,100
	Total	6,411
	TOTAL--Lake Ontario	20,506
	Lake Michigan	
2 1	Menominee County Line to Menominee--Mich	622
	Marinette to Suamico--Wis	8,350
	Suamico to Point Sable--Wis	4,380
	Total	13,352
2 2	Wisconsin, Illinois, Indiana	None
2 3	South Haven to Muskegon--Mich	2,827
2 4	Muskegon to Ludington--Mich	2,827
	Ludington to Empire--Mich	3,370
	Empire to Mackinac Bridge--Mich	715
	Mackinac Bridge to Peninsula Point--Mich	3,390
	Peninsula Point to Escanaba--Mich	3,210
	Escanaba to Menominee County Line--Mich	622
	Total	14,134
	TOTAL--Lake Michigan	30,313
	Lake Huron	
3 1	St Ignace to Detour--Mich	5,195
	Mackinac Bridge to Stoneport--Mich	955
	Stoneport to Point Au Sable--Mich	1 685
	Au Gres River outlet--Mich	940
	Point Au Gres to Sanganing River--Mich	5,940
	Total	14,715
3 2	Sanganing River to Linwood--Mich	4 885
	Pawkawlin River outlet--Mich	170
	Bay City to Point Aux Barques--Mich	28,645
	Point Aux Barques to Port Hope--Mich	225
	Hardwood Point to Harbor Beach--Mich	440
	Harbor Beach to Forestville--Mich	110
	Total	34,475
4 1	Forestville to Port Huron--Mich	None
	TOTAL--Lake Huron	49,190
	Lake Superior	
1 1	North Shore--Minn	None
	Superior to west boundary of Red Cliff Indian Reservation--Wis	2,430
	West boundary of Red Cliff Indian Reservation to Mich State Line--Wis	11,820
	Total	14,250
1 2	Copper Harbor to Point Abbaye--Mich	1,255
	Keweenaw Waterway--Mich	2,730
	Point Abbaye to Au Train River--Mich	550
	Au Train River to Whitefish Point--Mich	1,265
	Total	5,800
	TOTAL--Lake Superior	20,050
	Lake Erie	
4 1	Huron River to Ottawa River--Mich	11,025
4 2	Ottawa River to Marblehead--Ohio	12,305
	Sandusky Bay--Ohio	10,385
	Total	22,690
4 3	Erie-Lorain County Line to Penn State Line--Ohio	None
4 4	Presque Isle--Penn	960
	Penn -N Y line to Niagara River--N Y	None
	Total	960
	TOTAL--Lake Erie	34,675
	TOTAL--GREAT LAKES	154,734

NATIONAL WILDLIFE REFUGES

The Great Lakes Basin contains approximately 139,000 acres of National Wildlife Refuge lands managed primarily for waterfowl. Refuges in the Great Lakes Basin are managed basically as stopover areas for migrating waterfowl and vary in size from the two-acre Green Bay National Wildlife Refuge to the 95,500-acre Seney National Wildlife Refuge Most of these refuges are also used as breeding and nesting areas for some waterfowl and many other species of wildlife, including furbearers, songbirds, forest and farm game, and reptiles and amphibians. Refuges are not only important to animals, but also provide protection for many types of plant life. Recreational use of these refuges is not limited to nonconsumptive use (nature study, photography, picnicking, etc.), but includes consumptive use (fishing and hunting) on certain refuges in designated areas at specific times.

National wildlife refuges in the Great Lakes Basin are listed in the following tables These refuges are located on the primary migration routes and are situated in 9 of the 15 Great Lakes Basin planning subareas.

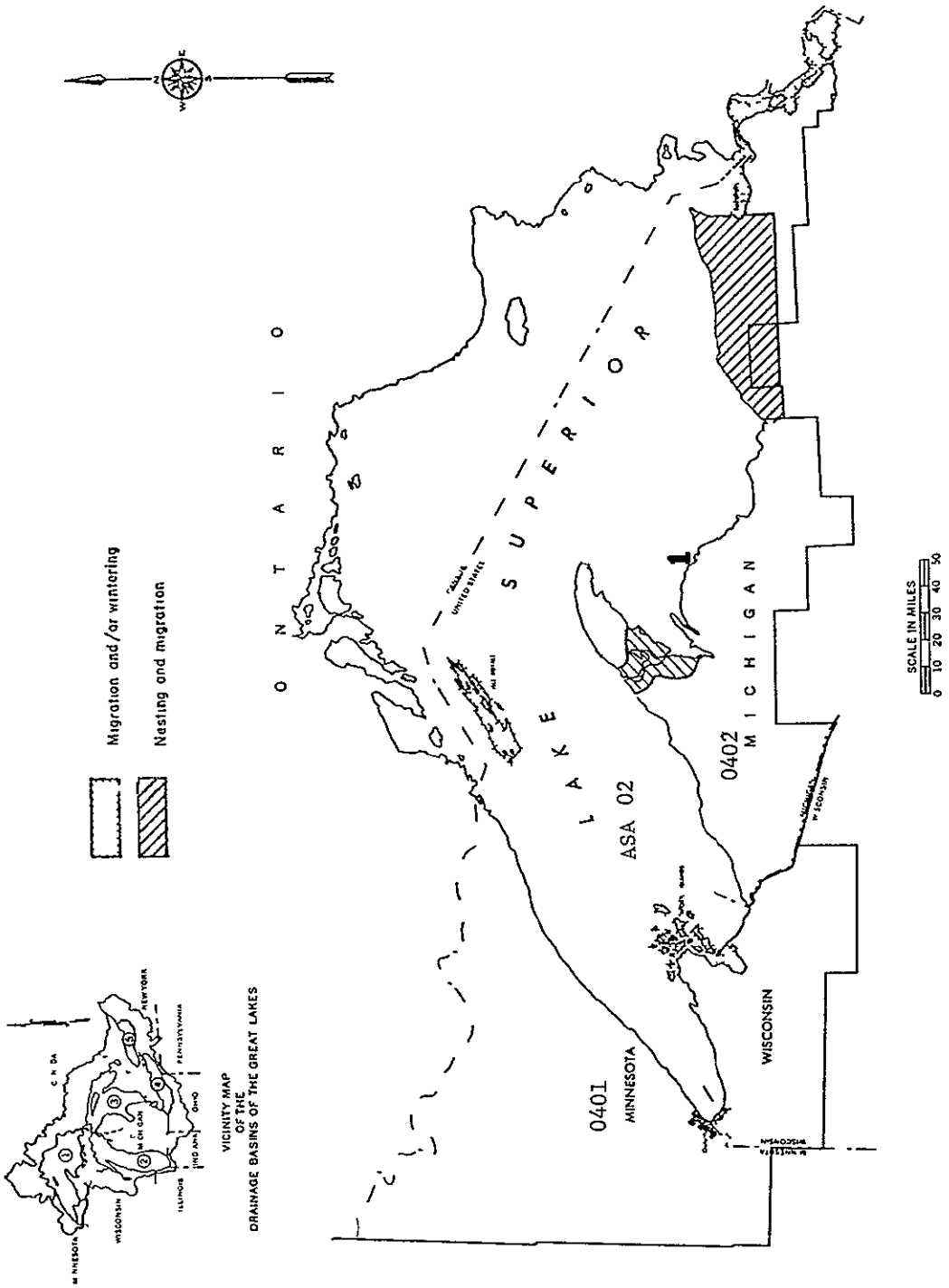
Great Lakes Basin National Wildlife Refuges

PSA	Refuge	Location	Primary Use	Acres of Habitat			
				Upland	Open Water	Marsh	Total
1.2	Huron	Marquette, Mich	Cormorants, gulls, terns	------	------	------	147
2 1	Horicon	Fond du lac, Dodge, Wis.	Waterfowl	7,165	7,325	6,346	20,836
2 1	Gravel Island Green Bay	Door, Wis.	Herons, gulls, Caspian terns	------	------	------	29
2 4	Seney	Schoolcraft, Mich.	Waterfowl	27,327	7,243	60,885	95,455
2 4 3 1	Michigan Island	Charlevoix, Mich. Alpena, Mich	Herons, gulls, terns	------	------	------	363
3 2	Shiawassee	Saginaw, Mich	Waterfowl	7,486	192	1,179	8,857
4 1	Lake St Clair	St Clair, Mich	Waterfowl	------	------	------	4,200
4 1	Wyandotte	Wayne, Mich	Diving ducks	------	------	------	304
4 2	Cedar Point	Lucas, Ohio	Waterfowl	100	445	1,700	2,245
4 2	Ottawa	Lucas, Ottawa, Ohio	Waterfowl	2,403	540	2,426	5,369
4 2	West Sister Is	Ottawa, Ohio	Heron rookery	------	------	------	82
5 1	Iroquois	Genesee, Orleans, N Y	Waterfowl	3,649	------	7,134	10,783
5 2	Montezuma	Seneca, N Y	Waterfowl	702	------	5,340	6,042

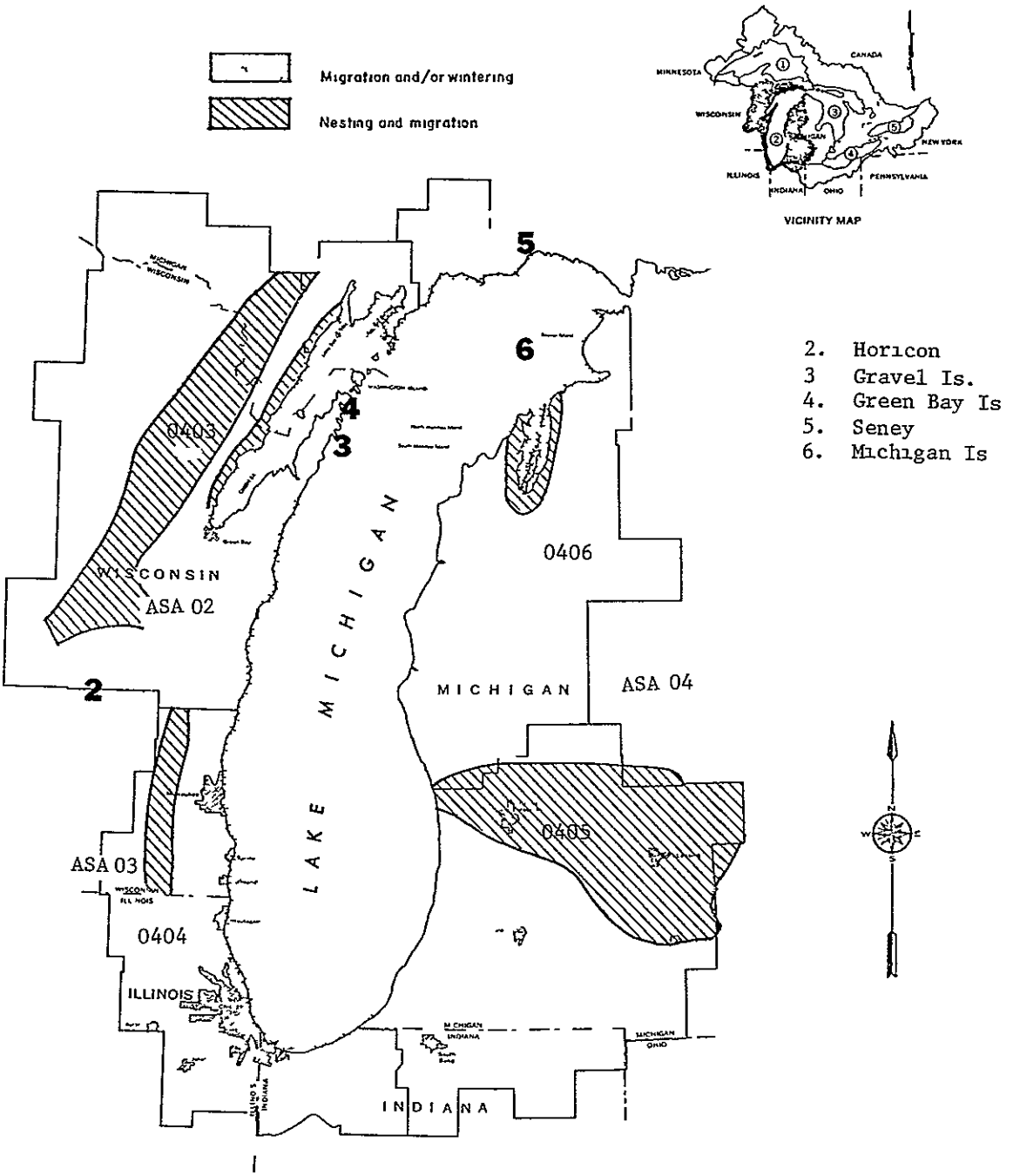
National Wildlife Refuges in the Great Lakes Basin—Waterfowl and Public Use (1970)

Refuge[1]	Waterfowl Use Days				Public Use Days			
	Ducks	Geese	Whistling Swans	Coots	Hunting	Fishing	Non-Consump	Total
Horicon	1,238,755	12,121,201	6,875	1,033,550	2,745	6,375	289,392	298,512
Seney	293,735	204,963	84	615	5,569	7,995	77,686	91,249
Shiawassee	5,523,735	3,311,203	74,466	69,818	9,623	-----	15,811	25,434
Cedar Point	736,016	26,532	11,634	201,497	-----	-----	-------	-------
Ottawa	4,708,222	1,183,380	16,224	535,064	-----	-----	-------	3,642
Iroquois	1,069,268	915,343	851	31,394	-----	-----	-------	177,636
Montezuma	2,326,788	1,939,803	330	239,377	-----	-----	-------	41,000

[1]No data are available for the following areas Huron, Gravel Island, Green Bay, Michigan Islands, Lake St Clair, Wyandotte, and West Sister Island



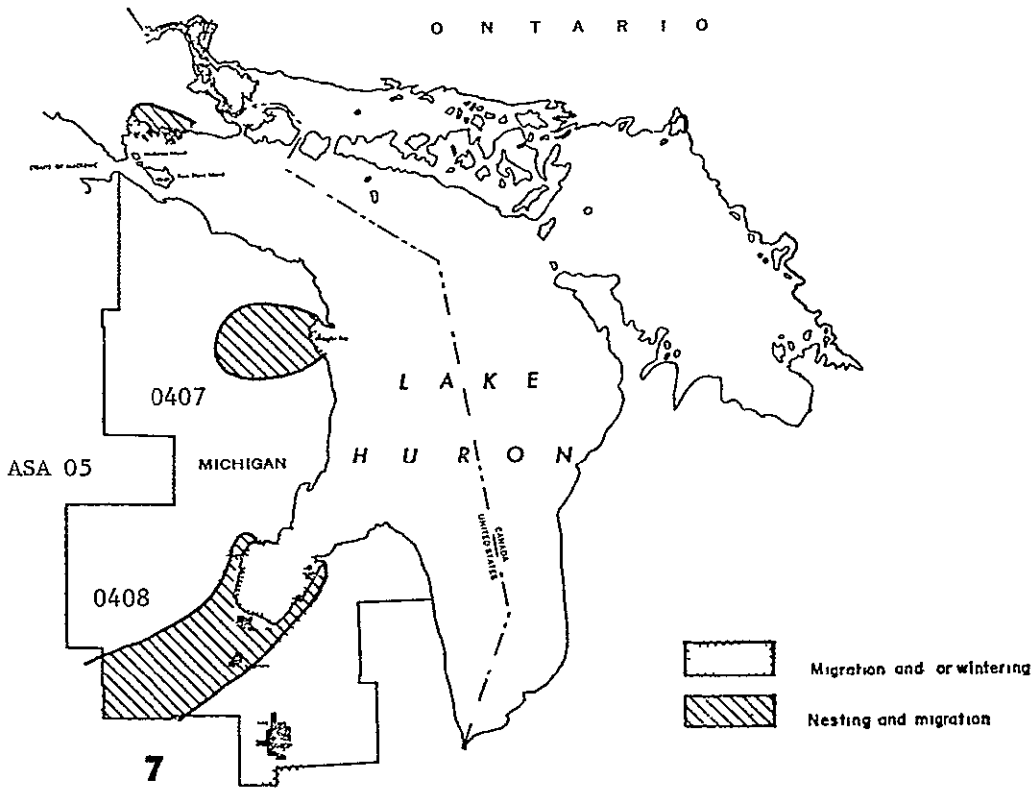
Primary Waterfowl Use Area and National Wildlife Refuges, Lake Superior Region



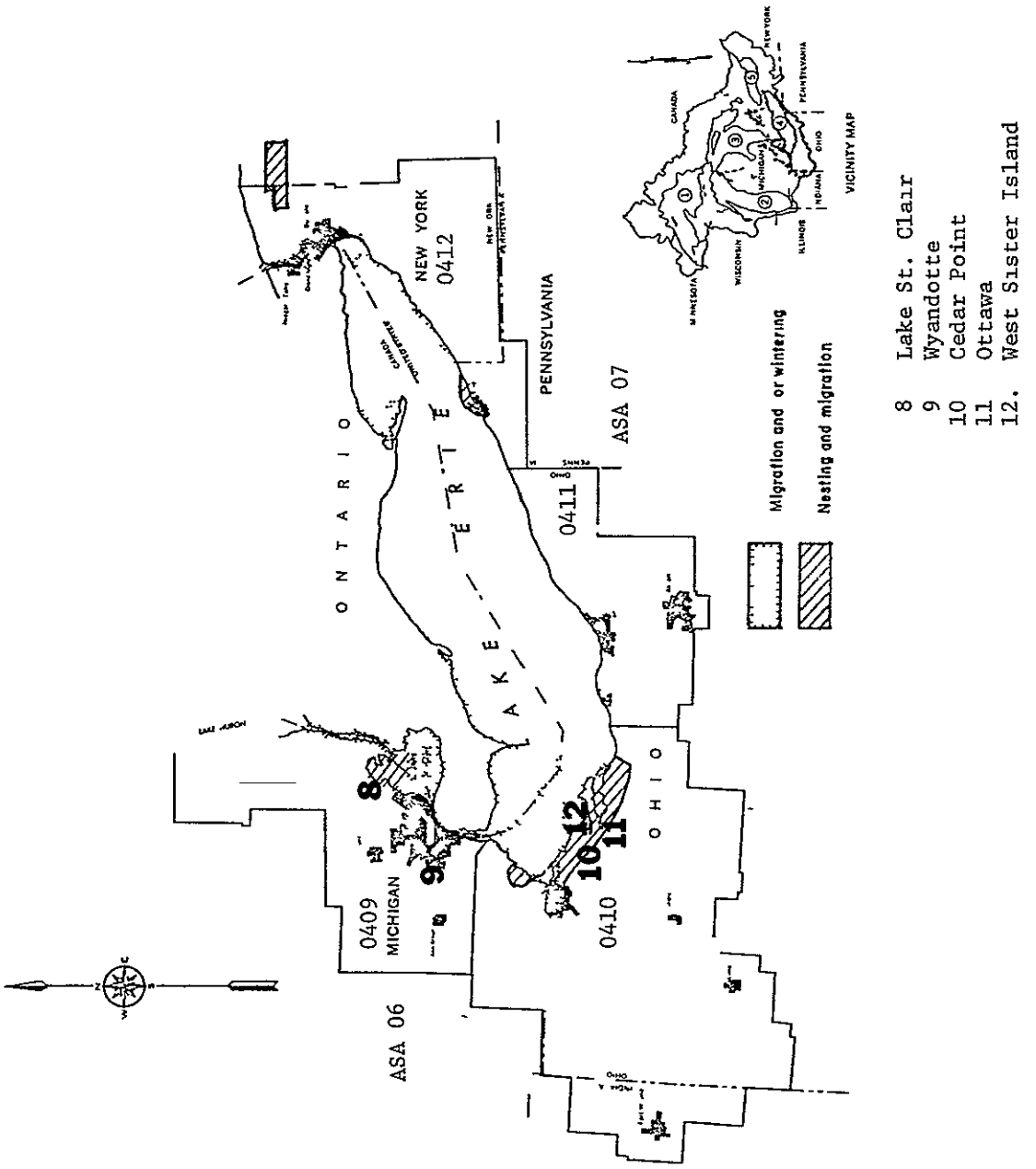
Primary Waterfowl Use Area and National Wildlife Refuges, Lake Michigan Region

VICINITY MAP

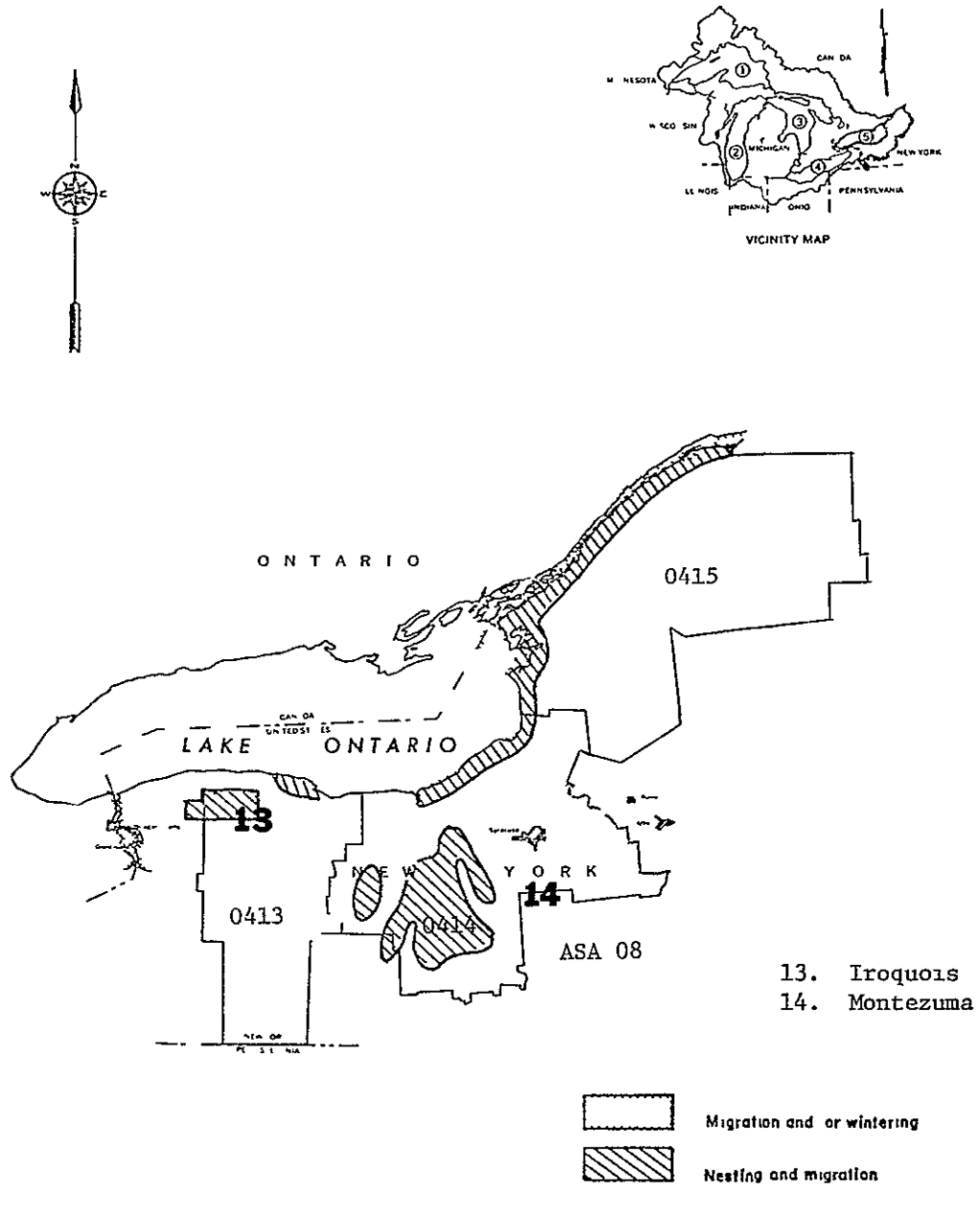
7 Shiawassee



Primary Waterfowl Use Area and National Wildlife Refuges, Lake Huron Region



Primary Waterfowl Use Area and National Wildlife Refuges, Lake Erie Region



Primary Waterfowl Use Area and National Wildlife Refuges, Lake Ontario Region

THREATENED FISH AND WILDLIFE OF THE GREAT LAKES BASIN

The fish and wildlife discussed in this section may be considered either 1) endangered, 2) threatened, or 3) status undetermined. The following list was taken from the 1973 edition of the U.S. Fish and Wildlife Service's Threatened Wildlife of the United States. This list is nationally oriented so that species rare in a particular area but abundant elsewhere are not included.

An endangered species is one in danger of extinction throughout all or a significant portion of its range. Endangered species are protected by the Endangered Species Act of 1973.

A threatened species is simply defined as one "which might become endangered in the forseeable future". No clear-cut line separates the two, with categorization depending upon the findings of the Secretary of the Interior in consultation with affected states, experts, and other interested persons and organizations.

A "status undetermined" species is one which has been suggested as possibly endangered but about which more information is required prior to classification

The following list categorizes threatened fish and wildlife in the Great Lakes Basin A list of threatened plants for each state in the Great Lakes Basin can be found in the Report on Endangered and Threatened Plant Species of the United States, presented to the Congress by the Secretary of the Smithsonian Institution, Serial No. 94-A, 1975.

Endangered

1. Birds
   - Kirtland's Warbler
2. Mammals
   - Indiana bat
   - Eastern Timber Wolf
   - Eastern Cougar
3. Fish
   - Longjaw Cisco
   - Blue Pike

Threatened

1. Birds
   - Northern Greater Prairie Chicken
   - Bald Eagle
   - Arctic Peregrine Falcon
2. Fish
   - Lake Sturgeon
   - Deepwater Cisco
   - Blackfin Cisco

Status Undetermined

1. Birds
   - American Osprey
   - Eastern Pigeon Hawk
2. Mammals
   - Fisher
   - Canada Lynx
   - Pine Marten
3. Fish
   - Shortnose Cisco

Information for this section was derived from 1) the United States Dept. of the Interior's 1973 edition of Threatened Wildlife of the United States and 2) the second installment of non-volumetric central case information provided to Study Directors of the National Assessment by the Water Resources Council, July 9, 1975.

UNUSUAL OR UNIQUE WILDLIFE

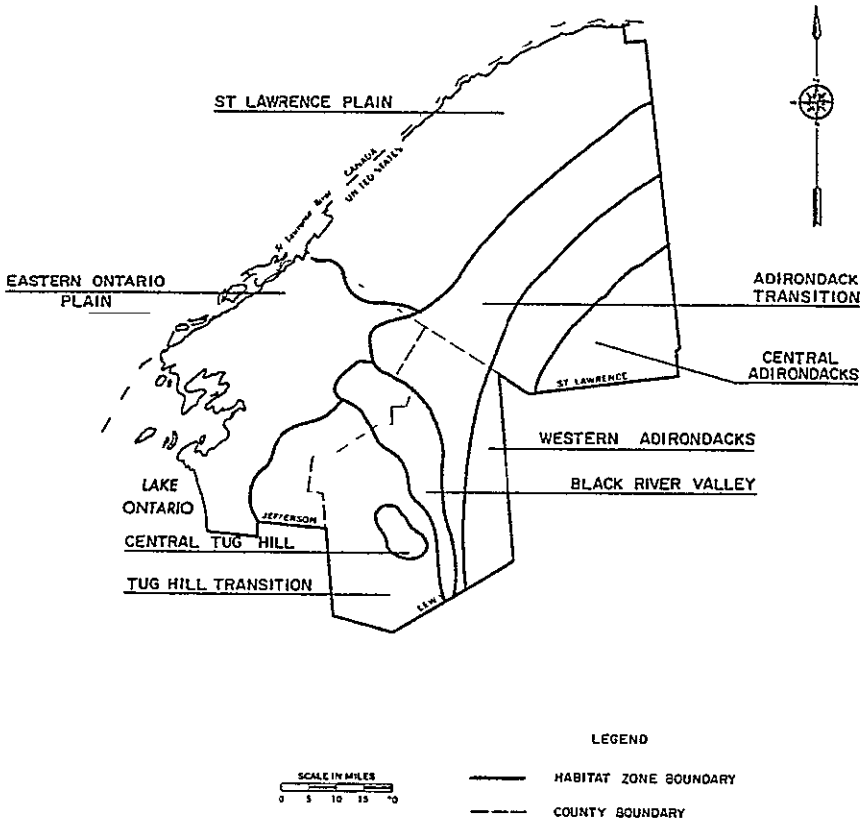
The following species are considered to be unusual or unique on a regional, state, or planning area basis. The map which follows delineates the zones described below for the State of New York. These zones were derived because of the great variety of habitat existing in Subarea 0415.

CLASS AND SPECIES	DENSITY	TREND	NOTES
ASA 01 (Minnesota, Wisconsin, Michigan)			
Spruce Grouse	Low	Stable	
Golden Eagle			Rare transient
Sandhill Crane	Low	Stable	
ASA 02 (Wisconsin, Michigan)			
Sandhill Crane	Varied	Increasing	S only, most--SW in Green Lake & Waushara Counties
Spruce Grouse	Low	Increasing	
Golden Eagle	Low	Decreasing	Rare migrant
ASA 03 (Wisconsin, Illinois, Indiana)			
Sandhill Crane	Low	Stable	
Golden Eagle	Low	Decreasing	Very rare migrant
ASA 04 (Subarea 0405 only, Indiana, Michigan)			
Golden Eagle			Rare transient
Sandhill Crane	Medium	Stable	
ASA 04 (Subarea 0406) and ASA 05 (Subarea 0407), both Michigan			
Sandhill Crane	Low	Increasing	
Spruce Grouse	Low	Stable	
Golden Eagle			Rare transient
Sharp-tailed Grouse	Low	Decreasing	Lower Peninsula
ASA 05 (Subarea 0408) and ASA 06 (Subareas 0409 and 0410), all in Michigan			
Sandhill Crane	Medium	Stable	
Golden Eagle			Rare transient
ASA 06 (Subarea 0410, Indiana, Ohio)			
Sandhill Crane			Accidental migrant Last nest reported in 1926 No longer recorded Low density and increasing in Indiana
Golden Eagle			Accidental migrant Not recorded annually Low density and decreasing in Indiana

CLASS AND SPECIES	DENSITY	TREND	NOTES
ASA 06 (Subarea 0410, Indiana, Ohio)--continued			
Lake Erie Water Snake	Low	Stable	Lake Erie islands only.
Eastern Plains Garter Snake	Low	Decreasing	Range only in part of Wyandot County in and near Killdeer Plains Wildlife Area
ASA 07 (Subarea 0411, Ohio)			
Golden Eagle			Accidental migrant
River Otter	Low	Decreasing	Recorded in Grand River watershed and vicinity
Eastern Smooth Green Snake	Low	Stable	
Boreal Redback Vole	Low	Decreasing	Formerly in Pymatuning Region--may be extirpated
ASA 07 (Subarea 0412, Pennsylvania and New York)			
Common Loon			A few transients
Great Blue Heron	Low	Unknown	
Least Bittern	Low	Unknown	
Lake Erie Water Snake	Low	Unknown	
Timber Rattlesnake	Low	Unknown	
Spotted Turtle	Low	Unknown	
Golden Eagle			A few transients
Eastern Bluebird	Low	Unknown	
Goshawk	Low	Decreasing	
ASA 08 (Subareas 0413 and 0414, New York)			
Golden Eagle			A few transients
Common Loon	Low	Decreasing	
Great Blue Heron	Low	Unknown	
Least Bittern	Low	Unknown	
Goshawk	Low	Decreasing	
Eastern Bluebird	Low	Unknown	
Massasauga Rattlesnake	Low	Unknown	
Spotted Turtle	Low	Unknown	
Timber Rattlesnake	Low	Unknown	
Arctic Three-toed Woodpecker	Low	Unknown	
Lincoln's Sparrow	Low	Unknown	
Bicknell's Thrush	Low	Unknown	
ASA 08 (Subarea 0415, New York, Black River Valley)			
Common Loon	Low	Decreasing	
Great Blue Heron	Low	Unknown	
Least Bittern	Low	Unknown	
Eastern Bluebird	Low	Unknown	
ASA 08 (Subarea 0415, New York, Tug Hill Transition)			
Common Loon	Low	Unknown	
Great Blue Heron	Low	Unknown	
Least Bittern	Low	Unknown	
Eastern Bluebird	Low	Unknown	
Lincoln's Sparrow	Low	Unknown	
ASA 08 (Subarea 0415, New York, Western Adirondacks)			
Common Loon	Low	Unknown	
Great Blue Heron	Low	Unknown	
Least Bittern	Low	Unknown	
Lincoln's Sparrow	Low	Unknown	
Bicknell's Thrush	Low	Unknown	
Spruce Grouse	Low	Stable	
Golden Eagle	Low	Stable	
Goshawk	Low	Decreasing	
Arctic Three-toed Woodpecker	Low	Unknown	

CLASS AND SPECIES	DENSITY	TREND	NOTES
ASA 08 (Subarea 0415, New York, Adirondack Transition and Central Adirondacks)			
Spruce Grouse	Low	Stable	
Golden Eagle	Low	Decreasing	Stable in Central Adirondacks
Goshawk	Low	Decreasing	
Common Loon	Low	Decreasing	
Great Blue Heron	Low	Unknown	
Least Bittern	Low	Unknown	
Arctic Three-toed Woodpecker	Low	Unknown	
Eastern Bluebird	Low	Unknown	Not present in Central Adirondacks.
Lincoln's Sparrow	Low	Unknown	
Bicknell's Thrush	Low	Unknown	
ASA 08 (Subarea 0415, New York, St Lawrence Plain and Eastern Ontario Plain			
Common Loon	Low	Decreasing	
Great Blue Heron	Low	Unknown	
Least Bittern	Low	Unknown	
Eastern Bluebird	Low	Unknown	
Lincoln's Sparrow	Low	Unknown	
Goshawk	Low	Decreasing	Not present in Eastern Ontario Plain

The information provided here was derived from Appendix 17 of the Great Lakes Basin Framework Study



Wildlife Habitat Zones, ASA 08, Subarea 0415, New York

GREAT LAKES FISHERY

A concern that surfaced during review of the draft State-Regional Future Report is the role of the Great Lakes as a potential food source. The possibilities of utilizing the Great Lakes as a source of needed fish and related products to meet future demands is a topic which needs further investigation. Stocking programs which could supply fish for sport and commercial fishing increased utilization of "rough" fish species could enhance the potential of the Great Lakes fishery

LAKE SUPERIOR

Commercial Fishery

Traditionally, Lake Superior has furnished approximately 16 percent of the total Great Lakes fishery production. Most of the commercial fishing is done in U.S. waters. Lake trout, whitefish, and lake herring have been the three dominant species in the commercial catch since the mid-1800s Recently, landings of the leading species such as chubs, lake herring, smelt, and whitefish have been declining. Since the early 1960s, there has been continuing concern for the precipitous reduction in herring catch. once the mainstay of the Lake Superior fishery Inshore lake trout catches are limited to assessment fishing to determine the results of sea lamprey control and lake trout stocking programs.

Sport Fishery

Warmwater species of importance to the lake's sport fishery include smelt, perch, suckers, centrarchid panfish, northern pike, walleye, and bass.

The lake's salmonid fishery is dominated by lake trout, with coho and chinook salmon, and rainbow, brown, brook, and steelhead trout contributing to the catch.

LAKE MICHIGAN

Commercial Fishery

The contribution of individual species to the commercial fishery has varied considerably depending upon intensity of the fishery and availability of high value species. Lake trout, lake herring, and walleye are no longer commercially important species. The chub production, which dominated Lake Michigan fisheries in the 1950s and early 1960s, has declined markedly in recent years. Whitefish and yellow perch populations show indications of recovering after years of heavy exploitation.

With the demise of high value species, there has been an increase in effort for low value alewife and smelt. Alewife hit a peak in abundance in 1967 prior to a major die-off. Current alewife and smelt production have now stabilized

Sport Fishery

In the State of Michigan's waters, the non-salmonid catch consisted primarily of yellow perch, smelt, suckers, smallmouth bass, northern pike, walleye, and assorted centrarchid panfish. The open water catch of salmonids consisted of coho and chinook salmon, rainbow trout, lake trout, and some brown and brook trout. Wisconsin's open water catch of salmonids included brook, brown, rainbow, and lake trout, and coho and chinook salmon The Lake Michigan total catch of salmonids by sportsmen is more than 1,700,000 annually, nearly equal to the total sport catch of salmon and steelhead in the five West Coast states of Washington, Oregon, California, Alaska, and Idaho.

LAKE HURON

Commercial Fishery

Commercial landings reflect the concentration on medium and low value species because of depressed stocks or near absence of many high value species like walleye, lake whitefish, and lake trout. Recently introduced high value species such as salmon, rainbow trout, and brown trout are reserved for the sport fishery. Landings in 1972 were 2.0 million pounds and worth $418,700--30 percent less in quantity and 16 percent less in value than in 1971. The harvest was an all-time low In 1972, fishermen took only 3,600 pounds of chubs, but in the late 1950s and early 1960s, chub landings ranged from 1 2 million pounds to 3 2 million each year.

Sport Fishery

Michigan's 1970 creel census of the Lake Huron sport fishery indicated that, of warmwater fish caught, smelt rank first followed by yellow perch, centrarchid panfish, suckers, bass, northern pike, and muskellunge. Catfish are gaining in importance to the sport fishery.

Species comprising the salmonid catch in Michigan waters included coho and chinook salmon and steelhead and lake trout

LAKE ERIE

Commercial Fishery

Walleye has always contributed to the commercial fisheries, but production since 1956 has dropped significantly Yellow perch, white bass, and channel catfish have also made significant contributions to the commercial landings. The white bass and yellow perch catch has been substantially reduced in recent years. Perch landings over a 50-year period averaged 7 million pounds annually, but in 1972, only 1 9 million pounds were harvested. Total landings declined to an all-time low of 7.9 million pounds in 1972, with U S. landings accounting for 21 percent of the Lake Erie production

Sport Fishery

United States sports fishing on Lake Erie during the past decade was directed primarily at the yellow perch, white bass, channel catfish, walleye, and smallmouth bass. Yellow perch is by far the most popular and harvested species sought throughout the lake. White bass and channel catfish angling is a spring and early summer fishery, confined primarily to the western and central basins. Walleye and smallmouth bass angling is concentrated in the Bass Islands and reef areas of the western basin and along the rocky shorelines of the central and eastern basins. Coho and chinook salmon have been stocked in recent years in an effort to expand the Lake Erie sport fishery
LAKE ONTARIO

Commercial Fishery

At present, there is very little commercial fishing in the New York waters of the open lake. The Canadian commercial fishery has been more extensive, but in recent years the number of fishermen has also declined Until the late 1960s, Canadian fish management was oriented to commercial fishing. Because valuable stocks have been

depleted and human population has expanded along the lakeshore, sport fishing has become more important in recent years. Landings of 282,500 pounds worth $68,400 were reported for 1972. The production was slightly better, however, than the 10-year average (1963-1972) of 279,400 pounds. Landings of bullheads, carp, eels, and white and yellow perch accounted for 82 percent of the total harvest.

Sport Fishery

Smallmouth bass is the most economically important species in the sport fishery. Yellow perch, brown bullhead, northern pike, rock bass, common bluegill, sunfish, largemouth bass, white perch, white bass, black crappie, carp, channel catfish, American eel, freshwater drum, and walleye also contribute to the sport catch and are listed in order of importance. A salmon fishery is currently being established in Lake Ontario to enhance the sports fishing potential.

VOLUMETRIC REQUIREMENTS

Volumetric requirements are presented for present and future volumes of water for each Aggregated Subarea (ASA) Water use, both withdrawal and consumptive, is presented in total and for various functional water use categories. Withdrawal use of water is defined as the water removed from the ground or diverted from a stream or lake for use. Consumptive use is the quantity of water discharged to the atmosphere or incorporated in the products of the process in connection with vegetative growth, food processing, or an industrial process The review procedure and the selection of a State-Regional Future condition were accomplished in a manner similar to that used for socio-economic characteristics The basic assumptions for projections in each category are summarized below, along with major differences in assumptions between the Great Lakes Basin Framework Study and the 1975 National Water Assessment

Although the base year for each of the studies also differed (Framework Study-1970, National Assessment-1975), one would expect that the base year figures for each water use category would be reasonably close to one another. Upon examination of these figures, however, it is evident that some of the base year values differ significantly This can be partially explained by the different definitions of water use categories and the degree to which certain water users were accounted for (eg. commercial water use is not completely covered by the Assessment). The methodology for calculating water use also influences the values obtained for withdrawal and consumptive water use. This report will be reviewed by the Water Resources Council for resolution and/or explanation of the large discrepancies in base year data.

Because individual water use categories may be defined somewhat differently, the percentage difference (between Framework Study and National Assessment) for base year total water withdrawals is presented below for each ASA Reasons for large discrepancies are cited when possible. Consumptive use differences for the base year are also indicated The primary reason for the consistently larger consumptive use figures developed for the National Assessment appears to be the assumptions of greater consumption per unit of water withdrawal.

ASA	Difference in base year figures - percentage (+ or - National Assessment (1975) differs from Framework Study (1970)		Possible reasons for large discrepancies in withdrawal figures
	Withdrawal	Consumptive	
01	-17%	+65%	Water withdrawal figures for manufacturing and mining vary significantly

02	+160%	+77%	Two major factors may be the cause of this substantial variation. The Assessment's ASA 02 includes Delta County while the Framework Study's values do not. Also, the steam electric withdrawal figures account for most of the difference A comparison which considers these differences follows For ASA 02 plus 04, the Assessment withdrawal figures are 48% greater Subtracting steam electric withdrawals, the Assessment's base year values are only 8% greater than the Framework Study for ASAs 02 and 04.
03	+32%	+2%	The major difference can again be attributed to steam electric withdrawal figures. The Assessment figures are 4% lower than the Framework Study is the steam electric category is excluded.
04	-3%	+52%	
05	+6%	-1%	
06	+22%	+31%	Steam electric and manufacturing withdrawals are significantly higher for the Assessment.
07	-20%	+66%	If steam electric withdrawals are excluded, the Assessment numbers are only 6% less.
08	+12%	-9%	
01-08 (Great Lakes Region)	+16%	+30%	If steam electric withdrawals are excluded, the Assessment numbers are only 2% greater than the Framework Study base year figures.

POPULATION

The following excerpt, from the 1972 OBERS Projections, Series E Population (Volume 1, Concepts, Methodology, and Summary Data), gives the basic assumption on fertility as used in the Framework Study (approximately Series C projections) and the Assessment (Series E)

> The four current population projections assume trends to four different total fertility levels at the year 2005 with no subsequent change. The total fertility rates per 1,000 women assumed to have been attained by the year 2005 are:

C-2

Series C - 2,800
Series D - 2,500
Series E - 2,100
Series F - 1,800

Series E was selected for this set of projections to provide a parallel set to the 1972 OBERS Series C projections. Series E calls for an approximate 44 percent rise in the population between 1971 and the year 2020. It involves a gradual movement toward a total fertility level of 2,100 by the year 2005. Under this E series, births and deaths approach equality. However, due to the character of the present age structure of the population a near-zero growth is not reached until the middle of the 21st century

DOMESTIC CENTRAL SYSTEM WATER USE

Assumptions	GLB Framework Study	1975 National Water Assessment
Population growth:	OBERS Series C (approx.)	OBERS Series E
Per capita usage rates:	Increase at 1% per year to 108 gpcd; 0.25% per year up to maximum of 130 gpcd	Constant rate based on 1970 U.S.G S data
Consumption:	10%	Ratio of total public supplied (industrial/ commercial and domestic) consumption to total public supplied withdrawal

DOMESTIC WATER USE FROM NON-CENTRAL SYSTEMS

Assumptions	GLB Framework Study	1975 National Water Assessment
Population:	Rural farm and non-farm population estimates based on projection developed for Appendix 19 (approx. OBERS Series C).	OBERS Series E plus a factor for the rate of decline of the portion of the national population served by non-central systems (based on 1960 and 1970 Census of Housing)
Per capita usage rates	Rates similar to those used for domestic central systems (i.e., increasing to 130 gpcd).	From a variety of data sources, the daily per capita use was estimated for two systems Pressure: 1975 66, 1985 75, 2000 84 Withdrawal Consumption: 40, 45, 50 Without Running Water Withdrawal: 10, 10, 10 Consumption: 10, 10, 10
Consumption	Percent of requirements: Rural non-farm - 15% Domestic rural farm - 25%	Percent of withdrawal: Pressure system - 60% w/o running water - 100%
Regional differences in water requirements per unit of use.	Regional differences based on climatic factors and economic activities (three groups of planning subareas were defined).	No differences within the Great Lakes Region.

MANUFACTURING WATER USE

Assumptions	GLB Framework Study	1975 National Water Assessment
Economic growth:	Translation of OBE employment projections into an economic output measure that would be transformed into a value added figure.	OBERS E projections, "business as usual" energy scenario.
Environmental and water quality objectives:	Incentives for water pollution control and cost minimization will encourage water recirculation and reuse (before 92-500). By 2000, the average plant in any industry group would be reusing its intake water as much as the most efficient regional group is today.	Objectives of P L 92-500 will be met: BPT by 1977; BAT by 1983, by 2000, no discharges. Increasing recirculation rates for the large water users.
Growth in water use.	For most industries, the relationship between gross water and value added is fairly constant.	Gross water use per dollar of gross product will remain constant; gross water use will grow in direct proportion to gross product derived from OBERS projections
Consumption.	Ratio between gross water use and consumption will remain relatively constant, for several industries in some planning subareas, the ratio was increased slightly due to increased recirculation rates.	Cooling water will be recycled using cooling lagoons or wet cooling towers, increasing evaporative losses, will be discontinued Increased recirculation rates will increase consumption.

MINERAL WATER USE

The methodology used by the Bureau of Mines in both the Framework Study and the National Assessment is similar mineral production was projected using past trends and recent developments and water use calculated by using water withdrawal and consumption numbers per production unit for each commodity. The major differences in the projections stem from recent developments and policy changes. Examples are the greater consumptive use requirements in ASA 01 due to more realistic figures on the use of water by the iron ore industry and the energy requirements dictated by federal policies and energy scenarios. Referring to the uncertainty of new mining developments, the following statement was made in a discussion of the Great Lakes Region for the Assessment's Central Case.

"Large quantities of water for mining and processing iron ore are used in ASA 01. As greater emphasis is placed on taconite beneficiation

water use could increase above projections. New copper-nickel developments in ASA 01 could require considerably more water than is currently projected for metals."

IRRIGATION WATER USE (Cropland only)

Assumptions	GLB Framework Study	1975 National Water Assessment
Soil types:	Irrigation will probably occur on soil types (Soil Resource Groups - SRGs) which are the same as those currently irrigated	
Irrigation acreage increase·	Rate of irrigation acreage increase assumes percentage of each crop irrigated on each SRG would double in 10 years.	Acres reported in the 1969 Agricultural Census plus additional irrigable land that includes land irrigated in 1975 and new privately developed acres as determined from past trends. Projected irrigated acres were determined by relative costs and returns of achieving projected commodity output levels by using irrigation systems versus dry land farming methods.
Irrigation efficiency		Current practice irrigation rates were assumed for 1985 and 2000.
Commodity demands:	SCS district conservationists supplied information on crops, soils, and crop yield for Appendix 19, Economic and Demographic Studies.	OBERS E-Prime agricultural projections were used, accounting for shifts that occurred in the late 1960's and early 1970's in both domestic consumption patterns and exports of agricultural commodities.
Consumption.	75% of withdrawal.	72-85% of withdrawal.

LIVESTOCK WATER USE

Assumptions	GLB Framework Study	1975 National Water Assessment
Projected livestock production	Based on national requirements as projected in Appendix 19, Economic and Demographic Studies (approx. OBERS Series C).	OBERS Series E.

Water use coefficients.	Rural water use budgets based on published reports were developed for 1970, 1980, 2000, and 2020 (Tables 6-9, 6-10, 6-11, and 6-12 of Appendix 6, Water Supply--Municipal, Industrial, and Rural).	Drinking water and other water use rates were estimated based on published reports Pasture conditions and temperature zones were considered
Consumption	90% of water requirements.	Consumption considered to be equal to withdrawal.

STEAM ELECTRIC POWER GENERATION WATER USES

The following excerpts are from a September 2, 1975 letter from Lenard Young of the Federal Power Commission.

> The most significant factor affecting differences in water withdrawal appears to be the assumptions made relative to the types of cooling systems employed at new generating plants. If a new plant is assumed to utilize a conventional once-through cooling system it may require, on the average, about 900 mgd of water withdrawal for each thousand megawatts of capacity when operated at 100 percent plant factor. On the other hand, the same generating plant utilizing a closed cycle type cooling system, either a cooling tower or a cooling pond, may require the withdrawal of less than 20 mgd for the same generation.
>
> In the early 1970's, when electric generating data for the Framework Study were developed, it was not clear what type of cooling system would predominate. Accordingly, two cases were analyzed--Case I where future generation would utilize conventional once-through cooling; and, in the alternative, Case II where all future generation would utilize some form of closed cycle cooling. Subsequent use of the data in the Framework Study has been premised on the assumption of a 50/50 mix of the Case I and Case II situations.
>
> Data developed for the National Assessment is based on current utility planning and reflects the recent trend away from conventional once-through cooling systems. This trend is clearly evidenced in the planning reports submitted to this office in 1975 by electric utility systems in the Great Lakes Basin area. With the exception of two facilities, all new generating plants of 300 megawatts or greater capacity for which construction has begun, or is scheduled to begin within the next two years, will utilize some form of closed cycle cooling. These data were incorporated into the National Assessment analysis and are primarily responsible for the reduction of water withdrawals.

LAKE SUPERIOR REGION - ASA 01

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

WITHDRAWAL

REGION Great Lakes(04)	ASA No 01		AREA (in acres x 1000) 16,998 4			SOURCE
STATES MN, WI, MI	COUNTIES Minnesota (4), Wisconsin (4), Michigan (9)					Fresh
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	50 6	54 8	65 7	40 5	42 3	43 8
Central	38 1	42 0	50 8	32 2	33 2	34 6
Non-Central	10 9	10 9	13 3	8 3	9 1	9 2
Manufacturing, Total	122 7	103 6	117 4	208.0	73 8	47 9
Food and Kindred Products	---	---	---	---	---	---
Paper and Allied Products	---	---	---	29 8	11 8	9 0
Chemical and Allied Products	---	---	---	71 4	8 1	4 5
Petroleum Products	---	---	---	9 6	4 8	2 9
Primary Metals	---	---	---	91 0	45 0	28 0
Others	---	---	---	6 2	4 1	3 4
Minerals, Total	572 2[1]	610 9	668 9	219 6	240 9	278 7
Metals	---	---	---	211 2	230 4	265 5
Non-Metals	---	---	---	8 4	10 5	13 2
Fuels	---	---	---	0	0	0
Irrigation, Total	2 9	5 0	7 6	---	---	---
Crops	8	5	6	4	6	9
Other	2 1	4 5	7 0	---	---	---
Livestock	1 7	1 8	1 6	1 9	2 1	2 2
Steam Electric[3]				556 0	381 0	187 0
Case I[2]	515 7	434 9	3127 1			
Case II	515 7	296 7	68 0			
Public Lands	---	---	---	22 4	30 9	38 2
Total Case I	1265 8	1211 0	3988 3	1048 8	771 6	598 6
Total Case II	1265 8	1072 8	929 2			

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment 4 Great Lakes Region and ASA s are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

LAKE SUPERIOR REGION - ASA 01

CONSUMPTIVE USE

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION: Great Lakes(04)	ASA No. 01	AREA (in acres x 1000) 16,998 4	SOURCE
STATES: MI, WI, MN	COUNTIES: Minnesota (4), Wisconsin (4), Michigan (9)		Fresh

FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	5 4	5 2	7 1	8 4	8 8	9 0
Central	3 7	3 5	5 1	3 2	3 3	3 5
Non-Central	1 7	1 7	2 0	5 2	5 5	5 5
Manufacturing, Total	11 6	16.2	36 0	24 9	28 8	36,8
Food and Kindred Products	---	---	---	---	---	---
Paper and Allied Products	---	---	---	1 8	1 8	7 2
Chemical and Allied Products	---	---	---	1 8	2 7	3 6
Petroleum Products	---	---	---	1 9	2 9	1 9
Primary Metals	---	---	---	18 0	20 0	22 0
Others	---	---	---	1 4	1 4	2 1
Minerals, Total	54 2[1]	88 1	131 2	81 8	89 8	99 2
Metals	---	---	---	80 6	88 3	98 4
Non-Metals	---	---	---	1 2	1 5	1 8
Fuels	---	---	---	0	0	0
Irrigation, Total	2 2	3 8	5 7	---	---	---
Crops	8	4	4	2	4	7
Other	1 4	3 4	5 3	---	---	---
Livestock	1 6	1 6	2 0	1 9	2 1	2 2
Steam Electric[3]				3 0	4 0	64 0
Case I[2]	3 9	3 3	24 0			
Case II	3 9	4 0	38 1			
Public Lands	---	---	---	9 8	14 1	19 0
Total Case I	78 9	118 2	206 0			
Total Case II	78 9	118 9	220 1	130 0	148 0	231 3

1 1968 value

2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970

3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

LAKE SUPERIOR REGION - ASA 01

MINNESOTA

The projections developed for the 1975 National Assessment in general appear to be more appropriate in almost all cases than those generated for the Framework Study. (The following observations and questions are taken directly from a January 15, 1976 letter from Don Rye)

1. Domestic, Commercial, Institutional, Manufacturing; and Minerals - Why are there such large differences in the 1970 FS and the 1975 NA figures for these categories? It would seem that these base year figures should be closer, regardless of the formulas used for projecting future water requirements.

2 Manufacturing - I think that it is presumptuous to assume that P L 92-500 water discharge standards will be met by the established dates because of the vast cost and time necessary for installation of treatment facilities. I think it is safer to assume that withdrawals and consumption will fall somewhere in between the FS and NA projections.

3. Steam Electric - The water requirements projected for this category in the NA appear to be fairly reasonable, except that 1985 water requirements might be higher because of the number of plants that are on-line now and will not be able to take full advantage of new technology and recycling techniques.

4. Irrigation, Crops - There is little if any cropland irrigation in northeastern Minnesota so I assume the increases are occurring elsewhere. There is a mistake in the NA projections for year 2000. Consumption is greater than withdrawal by .2 mgd ....In the cases where I have raised questions, it is because of my inability to evaluate the data without further background information.

WISCONSIN

On the whole, the State of Wisconsin prefers the recently generated Modified Central Case figures of the National Assessment. Specific comments and questions included (from a January 19, 1976 letter from Rahim Oghalai):

> The purpose of having a State/Regional Future is to allow states and regions to disagree with National Assessment projections if they feel their own projections are more reasonable and desirable. From a state point of view, the form in which these projections are provided--ASA level only--makes it virtually impossible to make comparisons with state water requirement projections, and thus impossible to judge whether any specific projection is reasonable or not. Whereas a state may be able to judge whether the assumptions seem reasonable, if those assumptions (between Framework and N.A.) are quite different, it has no way to check whether a drastically changed statistic is due purely to changed practices in water use, to a different amount of

activity (based on population or economic conditions) or to an incorrect calculation. These problems were especially acute in reviewing manufacturing and mineral water use.

We note that the N.A. estimate for consumption of Non-Central Domestic water assumes 60% and 100% of the water withdrawn is consumed. This contrasts to a 15% and 25% consumption rate assumed by the Framework Study and plays havoc with the domestic consumption totals. Explanatory material provided does not give any reason for this significant change in assumptions.

Under Irrigation, the Framework Study lists "Other" (Golf Courses) but the N A. does not. Where does the "Other" category go to? Since it is a far more significant use than crop irrigation--at least in this part of the country--it should be included somewhere.

ASA 01 - Consumption - Irrigation figures must be incorrect (or else the withdrawal figures are wrong). Assumptions say that irrigation consumption is 72-85% of withdrawal, but the N.A. figures show a consumption rate of 50%, 66% and 120% of withdrawal.

MICHIGAN

No preference.

PUBLIC REVIEW GROUP COMMENTS

Withdrawal and consumptive use projections for the year 2000 deviate excessively from the trends for 1970 and 1980. A change in direction back to once through cooling is foreseen - K A Carlson, Minnesota Power and Light Company.

WORK GROUP RECOMMENDATION

The differences in base year water requirements may be caused by differences in the data base, methodology, and definition of categories The ASA level of aggregation makes comparisons by State boundaries a difficult proposition Another basic problem with analyzing the data is the lack of background and basis for the assumptions used The consumptive use figure for irrigation should probably read .7 mgd (unconfirmed by WRC).

Recommendation. Adopt the National Assessment's projection of volumetric requirements as part of the State-Regional Future Total manufacturing withdrawal and consumptive use is based on the premise that the water quality goals specified in P.L. 92-500 will be met Assumptions on the degree to which the recycling and recirculation of process and waste waters would occur for certain industries are predicated upon meeting the P.L. 92-500 goals

NORTHWESTERN LAKE MICHIGAN REGION - ASA 02

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

WITHDRAWAL

REGION Great Lakes(04)	ASA No 02		AREA (in acres x 1000) 11,171 2			SOURCE Fresh
STATES WI, MI	COUNTIES Wisconsin (20), Michigan (4)					
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	79 7	102 5	143 5	75 9	84 0	92 1
Central	52 7	72 9	109 1	53 6	59 1	66 1
Non-Central	27 0	29 6	34 4	22.3	24 9	26 0
Manufacturing, Total	359	278	351	565 5	312 8	253 7
Food and Kindred Products	19	17	23	30 8	15 8	12 3
Paper and Allied Products	298	215	272	479 2	267 6	216 1
Chemical and Allied Products	5	5	8	---	---	---
Petroleum Products	5	8	5	---	---	---
Primary Metals	9	6	3	---	---	---
Others	23	27	39	55 5	29 5	25 3
Minerals, Total	2 6[1]	2 5	4 3	18 3	19 5	21 3
Metals	---	---	---	9 6	9 3	9 0
Non-Metals	---	---	---	8 7	10 2	12 3
Fuels	---	---	---	0 0	0 0	0 0
Irrigation, Total	21 2	40 3	59 6	---	---	---
Crops	13.6	30 0	41 9	37 1	56 7	77 2
Other	7 6	10 3	17 7	---	---	---
Livestock	20 5	27 8	36 2	19 6	20 3	21 5
Steam Electric[3]				2275 0	2315 0	1134 0
Case I[2]	669 3	1971 3	5404 1			
Case II	669 3	921 7	151 5			
Public Lands	---	---	---	2 7	3 9	5 2
Total Case I	1152 3	2422 4	5698 7			
Total Case II	1152.3	1372 8	446 1	2994 1	2812 2	1605 1

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment s Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

NORTHWESTERN LAKE MICHIGAN REGION - ASA 02

CONSUMPTIVE USE

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION Great Lakes(04)	ASA No 02			AREA (in acres ÷ 1000) 11,171 2			SOURCE
STATES WI, MI	COUNTIES Wisconsin (20), Michigan (4)						Fresh
FUNCTIONAL USE	GLB Framework Study			1975 National Assessment			
	1970	1980	2000	1975	1985	2000	
Domestic, Commercial, and Institutional, Total	10 5	12 8	17 0	19 0	20 9	22 1	
Central	5 5	7 3	11 0	5 3	5 9	6 6	
Non-Central	5 0	5 5	6 0	13 7	15 0	15 5	
Manufacturing, Total	40 3	55 7	96 4	73 1	123 8	196 2	
Food and Kindred Products	1 3	1 9	2 9	2 1	4 1	8 2	
Paper and Allied Products	35 3	48	80	64 2	109 4	170 9	
Chemical and Allied Products	0 3	1 0	4 0	---	---	---	
Petroleum Products	0 6	1 3	1 9	---	---	---	
Primary Metals	0 3	0 6	0 6	---	---	---	
Others	1 9	2 9	7 9	6 8	10 3	17 1	
Minerals, Total	1 4[1]	1 2	1 7	2 7	2 7	2 7	
Metals	---	---	---	1 5	1 2	1 2	
Non-Metals	---	---	---	1 2	1 5	1 5	
Fuels	---	---	---	0 0	0 0	0 0	
Irrigation, Total	15 9	30 2	44 7	---	---	---	
Crops	10 2	22 5	31 4	29 3	45 4	63 4	
Other	5 7	7 7	13 3	---	---	---	
Livestock	18 5	25 0	32 6	19 6	20 3	21 5	
Steam Electric[3]				16 0	16 0	71 0	
Case I[2]	5 1	15 1	41 5				
Case II	5 1	19 9	65 6				
Public Lands	---	---	---	2 7	3 9	5 2	
Total Case I	91 7	140 0	233 9	162 4	233 0	382 2	
Total Case II	91 7	144 8	258 0				

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment s Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

SOUTHWESTERN LAKE MICHIGAN REGION - ASA 03

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

WITHDRAWAL

REGION Great Lakes(04)	ASA No 03			AREA (in acres ~ 1000) 5,315 8			SOURCE
STATES WI, IL, IN	COUNTIES Wisconsin (7), Illinois (6), Indiana (4)						Fresh
FUNCTIONAL USE	GLB Framework Study			1975 National Assessment			
	1970	1980	2000	1975	1985	2000	
Domestic, Commercial, and Institutional, Total	1352.6	1571 3	1935 2	1438 1	1571 2	1760 5	
Central	1276 7	1489 6	1839 2	1386 4	1520 2	1714 9	
Non-Central	75 9	81 7	96.0	51 7	51 0	45 6	
Manufacturing, Total	5154	3461	3543	5107 2	1491 8	937 1	
Food and Kindred Products	176	157	170	189 7	67 8	47 9	
Paper and Allied Products	247	202	247	28 9	22 6	21 7	
Chemical and Allied Products	335	486	1295	309 2	101 3	86 8	
Petroleum Products	269	288	327	275 7	100 0	44 5	
Primary Metals	3800	1947	1007	4016 0	1096 0	628 0	
Others	327	381	497	287 6	104 1	108 2	
Minerals, Total	16 0[1]	34 0	61 9	57 0	60 9	67 8	
Metals	---	---	---	0 0	0 0	0.0	
Non-Metals	---	---	---	57 0	60 9	67 8	
Fuels	---	---	---	0 0	0 0	0 0	
Irrigation, Total	25 8	72 7	107 9	---	---	---	
Crops	7 4	27 8	31 0	12 1	18 8	25 4	
Other	18 4	44 9	76 9	---	---	---	
Livestock	11 7	12 5	13 3	9 1	9 5	9 4	
Steam Electric[3]				6771 0	5668 0	2603.0	
Case I[2]	3209 1	6822 0	23686 3				
Case II	3209 1	2220 7	564 4				
Public Lands	---	---	---	0 0	0 0	0 0	
Total Case I	10129 2	11973 5	29347 6	13394 6	8820 2	5403 2	
Total Case II	10129 2	7372 2	6225 7				

1968 value
For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31, 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment & Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

SOUTHWESTERN LAKE MICHIGAN REGION - ASA 03

CONSUMPTIVE USE

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION Great Lakes(04)	ASA No 03			AREA (in acres x 1000) 5,315 8			SOURCE Fresh
STATES WI, IL, IN	COUNTIES Wisconsin (7), Illinois (6), Indiana (4)						
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000	
Domestic, Commercial, and Institutional, Total	139 7	161 7	198 3	178 9	192 3	209 6	
Central	127 6	149 0	183 6	147 5	161 7	182.5	
Non-Central	12 1	12 7	14 7	31 4	30 6	27 1	
Manufacturing, Total	423	587	1202	380 8	504 9	675 8	
Food and Kindred Products	32	35	42	11 0	17 1	27 4	
Paper and Allied Products	42	58	93	6 3	9 0	15 4	
Chemical and Allied Products	67	128	452	19 0	34 4	64 2	
Petroleum Products	51	90	212	33 8	45 1	33 6	
Primary Metals	205	237	324	295 0	376 0	499 0	
Others	26	38	80	15 8	23 3	36 3	
Minerals, Total	0 6[1]	0 9	2 0	7 5	8 1	9 0	
Metals	---	---	---	0 0	0 0	0 0	
Non-Metals	---	---	---	7 5	8 1	9 0	
Fuels	---	---	---	0 0	0 0	0 0	
Irrigation, Total	19 4	54 5	80 9	---	---	---	
Crops	5 6	20 8	23 2	9 6	15 0	21 1	
Other	13 8	33 7	57 7	---	---	---	
Livestock	10 6	11 2	11 9	9 1	9 5	9 4	
Steam Electric[3]				45 0	129 0	274 0	
Case I[2]	24 5	52 1	181 8				
Case II	24 5	73 2	288 0				
Public Lands	---	---	---	0 0	0 0	0 0	
Total Case I	617 8	867 4	1676 9	630 9	858 8	1198 9	
Case II	617 8	888 5	1783 1				

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment's Great Lakes Region and ASA s are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

EASTERN LAKE MICHIGAN REGION - ASA 04

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

WITHDRAWAL

REGION Great Lakes(04)	ASA No 04		AREA (in acres x 1000) 16,796 1			SOURCE Fresh
STATES IN, MI	COUNTIES Indiana (6), Michigan (39)					
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	281 4	343 4	487 5	224 4	258 8	300 1
Central	198 9	254 0	383 2	139 3	162 4	195 9
Non-Central	82 5	89 4	104 3	85 1	96 4	104 2
Manufacturing, Total	649 5	626 4	722 5	502.4	144 8	129 3
Food and Kindred Products	23 5	23 5	33 1	26 0	11 0	8 9
Paper and Allied Products	181 6	148 7	202 8	155 5	63 3	44 3
Chemical and Allied Products	288.8	302 2	334 5	150 1	34 4	30 7
Petroleum Products	---	---	---	2 5	1 2	0 7
Primary Metals	59 2	46 0	29 8	45 0	11 0	7 0
Others	96 4	106 0	122 3	123 3	24 0	37 6
Minerals, Total	15 3[1]	23 7	42 7	71 1	90 0	119 1
Metals	---	---	---	0.0	0 0	0 0
Non-Metals	---	---	---	64 8	82 2	109 2
Fuels	---	---	---	6 3	7 8	9 9
Irrigation, Total	52 4	111 1	169 9	---	---	---
Crops	45 8	88 6	131 0	74 7	108 6	144 1
Other	6 6	22 5	38 9	---	---	---
Livestock	16 7	24 1	38 6	15 0	14 7	14 7
Steam Electric[3]				1556 0	1006 0	448 0
Case I[2]	1524 8	3845 0	14201 9			
Case II	1524 8	811 0	303 9			
Public Lands	---	---	---	11 0	11 9	12 9
Total Case I	2540 1	4973 7	15663 1	2454 6	1634 8	1168 3
Case II	2540 1	1939 7	1765 1			

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment s Great Lakes Region and WSA's are defin i along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

EASTERN LAKE MICHIGAN REGION - ASA 04

CONSUMPTIVE USE

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION Great Lakes(04)	ASA No 04		AREA (in acres x 1000) 16,796.1			SOURCE Fresh
STATES IN, MI	COUNTIES Michigan (39), Indiana (6)					
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	34 0	40 6	55 7	65 7	74 2	81 7
Central	20.0	25 4	38 3	13 9	16 2	19 6
Non-Central	14 0	15 2	17 4	51 8	58 0	62 1
Manufacturing, Total	61 1	102 1	288 9	59 9	68 3	85 4
Food and Kindred Products	4 8	6 1	9 6	5 5	5 5	4 8
Paper and Allied Products	24 2	34 9	61 5	30 7	34.4	35 3
Chemical and Allied Products	25 2	50 2	195 9	12 7	19 0	22 6
Petroleum Products	---	---	---	5	7	6
Primary Metals	2 2	3 2	5 5	1 0	2 0	5 0
Others	4 7	7 7	16 4	9 5	6 8	17 1
Minerals, Total	4[1]	6	1 4	12 3	13 5	19 8
Metals	---	---	---	0 0	0 0	0 0
Non-Metals	---	---	---	8 7	9 3	14 4
Fuels	---	---	---	3 6	4 2	5 4
Irrigation, Total	39 3	83 3	127 4	---	---	---
Crops	34 4	66 4	98 2	59 4	88 7	121 9
Other	4 9	16 9	29 2	---	---	---
Livestock	15 0	21 7	34 7	15 0	14 7	14 7
Steam Electric[3]				35 0	59 0	169 0
Case I[2]	14 2	32 3	113 9			
Case II	14 2	46 1	177 7			
Public Lands	---	---	---	2 0	2 9	3 9
Total Case I	164 0	280 6	622 0	249 3	321 3	496 4
Total Case II	164 0	294 4	685 8			

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31, 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment s Great Lakes Region and ASA s are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

NORTHWESTERN LAKE MICHIGAN REGION - ASA 02

MICHIGAN

No preference.

WISCONSIN

On the whole, the State of Wisconsin prefers the recently generated Modified Central Case figures of the National Assessment The other general comments mentioned for ASA 01 apply here also.

WORK GROUP RECOMMENDATION

Adopt the National Assessment's projection of volumetric requirements as a part of the State-Regional Future.

SOUTHWESTERN LAKE MICHIGAN REGION - ASA 03

WISCONSIN

On the whole, the State of Wisconsin prefers the recently generated Modified Central Case figures of the National Assessment. The other general comments mentioned for ASA 01 apply here also.

ILLINOIS

Providing comments on this section of the report becomes very difficult due to the aggregation of subareas In light of that fact, however, the validity of the majority of figures appears strengthened by the similarity of results between the two processes

INDIANA

In all cases, for each functional use, it appears either projection is reasonable and seemingly accurate.

WORK GROUP RECOMMENDATION

Adopt the National Assessment's projection of volumetric requirements as a part of the State-Regional Future.

EASTERN LAKE MICHIGAN REGION - ASA 04

INDIANA

In all cases, for each functional use, it appears either projection is reasonable and seemingly accurate.

MICHIGAN

No preference.

WORK GROUP RECOMMENDATION

Adopt the National Assessment's projection of volumetric requirements as a part of the State-Regional Future.

LAKE HURON REGION - ASA 05

WITHDRAWAL

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION Great Lakes(04)	ASA No 05		AREA (in acres x 1000) 8,628 4			SOURCE Fresh
STATES MI	COUNTIES 22					
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	112 6	137 8	195 3	91 7	108 7	129 9
Central	79 8	101 3	150 9	57 7	68 8	85 1
Non-Central	32 8	36 5	44 4	34 0	39 9	44 8
Manufacturing, Total	592	558	528	687 0	143 9	113 5
Food and Kindred Products	---	---	---	18 5	11 0	8 9
Paper and Allied Products	---	---	---	---	---	---
Chemical and Allied Products	---	---	---	350 8	94 0	76 8
Petroleum Products	---	---	---	131 1	14 3	5 7
Primary Metals	---	---	---	3 0	4 0	5 0
Others	---	---	---	183 6	20 5	17 1
Minerals, Total	16 6[1]	22 4	33 8	73 5	91 8	119 7
Metals	---	---	---	0 0	0 0	0 0
Non-Metals	---	---	---	71 1	89 1	116 4
Fuels	---	---	---	2 4	2 7	3 3
Irrigation, Total	6 4	29 3	42 1	---	---	---
Crops	5 2	21 0	28 8	11 7	17 1	23 0
Other	1 2	8 3	13 3	---	---	---
Livestock	6 5	11 1	15 8	5 7	5 6	5 7
Steam Electric[3]				714 0	466 0	112.0
Case I[2]	749 1	3310 0	15858 9			
Case II	749 1	446 2	284 8			
Public Lands	---	---	---	1 1	1 6	2 2
Total Case I	1483 2	4068 6	16673 9	1584 7	834 7	506 0
Case II	1483 2	1204 8	1099 8			

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment s Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

LAKE HURON REGION - ASA 05

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

CONSUMPTIVE USE

REGION Great Lakes(04)	ASA No 05		AREA (in acres x 1000) 8,628 4			SOURCE Fresh
STATES: MI	COUNTIES 22					
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	13 6	16 5	22 6	25 3	29 5	33 5
Central	8 0	10 2	15 2	4 6	5 5	6 8
Non-Central	5 6	6 3	7 4	20 7	24 0	26 7
Manufacturing, Total	36.5	66 1	255 0	11 8	31 4	83 0
Food and Kindred Products	---	---	---	7	2 1	6 2
Paper and Allied Products	---	---	---	---	---	---
Chemical and Allied Products	---	---	---	6 3	19 9	59 7
Petroleum Products	---	---	---	1 3	3 0	4 6
Primary Metals	---	---	---	0 0	1 0	3 0
Others	---	---	---	3 5	5 4	9 5
Minerals, Total	1 7[1]	2 5	3 9	10 8	13 5	17 4
Metals	---	---	---	0 0	0 0	0 0
Non-Metals	---	---	---	9 5	12 0	15 6
Fuels	---	---	---	1 2	1 5	1 8
Irrigation, Total	4 8	22 0	31 6	---	---	---
Crops	3 9	15 8	21 6	9 3	14 0	19 4
Other	0 9	6 2	10 0	---	---	---
Livestock	5 8	10 0	14 3	5 7	5 6	5 7
Steam Electric[3]				4 0	11 0	62 0
Case I[2]	5 7	42 3	134 8			
Case II	5 7	55 4	205 4			
Public Lands	---	---	---	1 1	1.6	2 2
Total Case I	68 1	159 4	462 2	68 0	106 6	223 2
Total Case II	68 1	172 5	532 8			

1 1968 value

2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970

3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment s Great Lakes Region and ASA s are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

LAKE HURON REGION - ASA 05

MICHIGAN

No preference.

WORK GROUP RECOMMENDATION

Adopt the National Assessment's projection of volumetric requirements as a part of the State-Regional Future.

WESTERN LAKE ERIE REGION - ASA 06

1975 NATIONAL ASSESSMENT — WITHDRAWAL
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION Great Lakes(04)	ASA No 06		AREA (in acres x 1000) 10,430 8		SOURCE Fresh
STATES MI, IN, OH	COUNTIES Michigan (9), Indiana (3), Ohio (20)				
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	683.3	824 5	1129 8	565 3	632 4	719 0
Central	607 6	742 0	1033 7	508 9	575 4	667 0
Non-Central	75 7	82 5	96 1	56 4	57 0	52 0
Manufacturing, Total	1933 8	1632 5	1456 6	3067 5	988 6	668 7
Food and Kindred Products	44 0	46 0	60 0	41 8	24 0	19 9
Paper and Allied Products	53 8	43 5	167 6	77 8	44 3	34 4
Chemical and Allied Products	345 0	358 0	388 0	335 4	49 7	36 2
Petroleum Products	221 0	205 0	175 0	255 2	66 0	28 0
Primary Metals	961 0	641 0	265 0	1691 0	484 0	290 0
Others	309 0	339 0	401 0	666 4	320 5	260 3
Minerals, Total	61 8[1]	84 5	146 7	137 1	178 5	241.5
Metals	---	---	---	0 0	0 0	0 0
Non-Metals	---	---	---	132 9	173 7	235 8
Fuels	---	---	---	4 2	4 8	5 7
Irrigation, Total	32 6	84 3	124 3	---	---	---
Crops	12 4	47 1	59 0	15 4	21 4	27 9
Other	20 2	37 2	65 3	---	---	---
Livestock	16 0	22 8	31 3	12 5	12 3	12 2
Steam Electric[3]				5362 0	4195 0	1543 0
Case I[2]	4742 8	5080 6	17899 3			
Case II	4742 8	2158 3	848 4			
Public Lands	---	---	---	0 0	0 0	0 0
Total Case I	7470 3	7729 2	20788 0	9159 9	6028 1	3212 2
Total Case II	7470 3	4806 9	3737 1			

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment & Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

WESTERN LAKE ERIE REGION - ASA 06

CONSUMPTIVE USE

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION. Great Lakes(04)	ASA No 06			AREA (in acres x 1000) 10,430 8			SOURCE
STATES MI, IN, OH	COUNTIES Michigan (9), Indiana (3), Ohio (20)						Fresh
FUNCTIONAL USE	GLB Framework Study			1975 National Assessment			
	1970	1980	2000	1975	1985	2000	
Domestic, Commercial, and Institutional, Total	73 6	88 3	119 2	83 0	89 2	94 7	
Central	60 8	74 3	103 4	48.6	54 9	63 7	
Non-Central	12 8	14 0	15 8	34 4	34 3	31 0	
Manufacturing, Total	190 3	264 6	588 1	459 9	504 5	495 0	
Food and Kindred Products	7 3	9 3	14 5	13 0	13 0	11 6	
Paper and Allied Products	7 3	10 3	53 6	12 7	17 2	27 1	
Chemical and Allied Products	29 2	55 0	201 0	1 8	8 1	27 1	
Petroleum Products	26 5	43 7	103 0	18 7	26-5	22 4	
Primary Metals	101 2	118 0	156 0	335 0	324 0	230 0	
Others	18 8	28 3	60 0	78 8	115 8	176 7	
Minerals, Total	1 9[1]	2 6	4 7	20 1	25 8	34 8	
Metals	---	---	---	0 0	0 0	0 0	
Non-Metals	---	---	---	17 7	23 1	31 5	
Fuels	---	---	---	2 4	2 7	3 3	
Irrigation, Total	24 5	63 2	93 2	---	---	---	
Crops	9 3	35 3	44 2	12 1	17 1	23 4	
Other	15 2	27 9	49 0	---	---	---	
Livestock	14 4	20 5	28 2	12 5	12 3	12 2	
Steam Electric[3]				34 0	141 0	322 0	
Case I[2]	40 1	49 9	146 2				
Case II	40 1	63 5	224.3				
Public Lands	---	---	---	0 0	0 0	0 0	
Total Case I	474 4	489 1	979 6	621 6	789 9	982 1	
Total Case II	474 4	502 7	1057 7				

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework duly considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment of Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

EASTERN LAKE ERIE REGION - ASA 07

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

WITHDRAWAL

REGION Great Lakes (04)	ASA No 07	AREA (in acres x 1000) 5,445 2	SOURCE Fresh
STATES OH, PA, NY	COUNTIES Ohio (8), Pennsylvania (1), New York (4)		

FUNCTIONAL USE	GLB Framework Study 1970	GLB Framework Study 1980	GLB Framework Study 2000	1975 National Assessment 1975	1975 National Assessment 1985	1975 National Assessment 2000
Domestic, Commercial, and Institutional, Total	640.2	719 8	929 0	638 6	680 9	740 6
Central	606 3	685 3	884.0	604 8	643 8	701 7
Non-Central	33 9	34.5	45 0	33 8	37 1	38 9
Manufacturing, Total	2562	2317	2137	2353 3	696 4	447 0
Food and Kindred Products	36	36	43	16 4	8 9	6 8
Paper and Allied Products	65	41	49	79 6	41 6	31 6
Chemical and Allied Products	748	810	991	683 5	128 4	91 3
Petroleum Products	71	68	72	148 1	23 7	9 6
Primary Metals	1480	1216	727	1114 0	413 0	237 0
Others	162	146	255	311 7	80 9	70 5
Minerals, Total	26 8[1]	40 3	80 0	60 6	72 3	90 0
Metals	---	---	---	0 0	0 0	0 0
Non-Metals	---	---	---	59 1	70 5	88 2
Fuels	---	---	---	1 5	1 8	1 8
Irrigation, Total	32 2	30 7	51 4	---	---	---
Crops	4 6	8 3	13 6	11 1	15 0	19 1
Other	27 6	22 4	37 8	---	---	---
Livestock	7 4	8 2	9 5	5 8	5 9	6 1
Steam Electric[3]				2784 0	3511 0	2858 0
Case I[2]	4018 8	4288 6	15993 6			
Case II	4018 8	3174 3	454 9			
Public Lands	---	---	---	0 0	0 0	0 0
Total Case I	7287 4	7404 6	19200 5	5853 3	4981 5	4160 8
Total Case II	7287 4	6290 3	3661 8			

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

EASTERN LAKE ERIE REGION - ASA 07

CONSUMPTIVE USE

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION Great Lakes(04)	ASA No.- 07			AREA (in acres x 1000) 5,445 2			SOURCE
STATES- OH, PA, NY	COUNTIES Ohio (8), Pennsylvania (1), New York (4)						Fresh
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000	
Domestic, Commercial, and Institutional, Total	65 8	78 5	94 7	105 6	112 9	121 9	
Central	60 3	72 9	87 5	85 1	90 6	98 7	
Non-Central	5 5	5 6	7 2	20 5	22 3	23 2	
Manufacturing, Total	189 6	276 9	632 0	428 2	403 1	326 3	
Food and Kindred Products	3 5	4 1	4 8	2 7	2 7	3 4	
Paper and Allied Products	9 7	11 8	18 0	12 7	17 2	24 4	
Chemical and Allied Products	44 0	87 0	331 0	19 0	35 3	70 5	
Petroleum Products	9 8	15 1	33.0	2 1	5 0	7 8	
Primary Metals	107 8	138 5	202 0	376 0	321 0	188 0	
Others	14 8	20 4	43 2	15 8	21 9	32 2	
Minerals, Total	9 9[1]	15 2	32 3	8 7	10 2	12 9	
Metals	---	---	---	0 0	0 0	0 0	
Non-Metals	---	---	---	7 8	9 3	11 7	
Fuels	---	---	---	9	9	1 2	
Irrigation, Total	24 2	23 0	38 6	---	---	---	
Crops	3 5	6 2	10.2	8 5	11 5	14 7	
Other	20 7	16 8	28 4	---	---	---	
Livestock	6 7	7 4	8 5	5 8	5 9	6 1	
Steam Electric[3]				16 0	58 0	144 0	
Case I[2]	48 8	32.4	123 0				
Case II	48 8	32 4	190 0				
Public Lands	---	---	---	0 0	0 0	0 0	
Total Case I	345 0	433 4	929 1	572 9	601 6	625 9	
Total Case II	345 0	433 4	996 1				

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31, 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970 .
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment's Great Lakes Region and ASA s are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

WESTERN LAKE ERIE REGION - ASA 06

MICHIGAN

No preference.

INDIANA

In all cases, for each functional use, it appears either projection is reasonable and seemingly accurate.

OHIO

In general, the State of Ohio finds the procedures used to derive water requirements for each functional use to be valid. In addition, it was felt that those figures projected by the 1975 National Assessment are more accurate than those projected by the Framework Study.

Framework Study figures project significantly higher levels of activity than Ohio is expected to achieve to the year 2000.

WORK GROUP RECOMMENDATION

Adopt the National Assessment's projection of volumetric requirements as a part of the State-Regional Future.

EASTERN LAKE ERIE REGION - ASA 07

OHIO

In general, the State of Ohio finds the procedures used to derive water requirements for each functional use to be valid. In addition, it was felt that those figures projected by the 1975 National Assessment are more accurate than those projected by the Framework Study.

Framework Study figures project significantly higher levels of activity than Ohio is expected to achieve to the year 2000.

PENNSYLVANIA

Pennsylvania's position on volumetric requirements can best be summed up by the following excerpts from a January 22, 1976 letter from William Frazier:

> In responding to the request for an assessment of the volumetric requirements proposed for the SRF, i.e., water demand projections of the Great Lakes Framework Study and of the Modified Central Case (MCC) for the National Assessment, we find that an analytic estimate to be very difficult from our level. While we are able to relate directly to the Framework Study estimates through Appendix 6, the MCC estimates are not disaggregated to State levels. Consequently, our assessment

is limited to comparison of the basic assumptions used for our preferred estimates (State Water Plan) and their inferences with respect to the proposed estimates.

....The basis for the water demand estimates was information from questionnaires sent to the various users within the hydrologic region. For the "Public" category, this included information on capacities and service areas as well as current and anticipated withdrawals. The other "use" categories were limited to self-supplied users. Approximately 100 percent of available information was obtained for the public and manufacturing categories through "follow-up" activities, and an estimated 90 percent was obtained for the other categories.

Enclosure 3 [portions of which are reproduced below] shows the use categories and the water demand estimates for each. Since these are our preferred estimates, Enclosure 3 is being sent in lieu of the response form provided with your memo. Our projections cannot be redistributed to the differing categories used by the latter because of the different approaches used in making the estimates, e.g., the SRF identifies total uses for manufacturing from estimating models based on production, whereas the same category in Enclosure 3 is limited to withdrawals supplied by manufacturing plants for operation. Those plants that purchase water from public suppliers are therefore excluded from this category.

In comparing Enclosure 3 with the Framework Study estimates, we find the latter tends to be significantly higher. This is probably due to the use of higher population projections (OBERS Series C). We could not make any comparison with the MCC estimates due to their aggregative nature. Although the MCC used similar population projections as we did, we hesitate to endorse such estimates due to the differences in use categories. The grounds for our preference is the superior validity of the basic information used in making the estimates, and we strongly recommend their use in the SRF.

Portions of the Enclosure 3 table.

PENNSYLVANIA CONSOLIDATED WATER USE REPORT
BUREAU OF RESOURCES PROGRAMMING, D.E.R.

October 16, 1975

Subbasin 15
Lake Erie Basin
Pennsylvania Portion

Type Use	1970 Water Use (MGD)			1990 Water Demand (MGD)		
	Total Water Use	Consumptive Losses	Inter-Basin Transfer Losses	Total Water Use	Consumptive Losses	Inter-Basin Transfer Losses
Public:	47.653	4.765	-1.384	51.743	5.174	-1.455
Mineral·	0.020	0.001	0.000	0.031	0.002	0.000
Manuf.:	36.135	2.762	0.000	19.364	2.457	0.000
Power:	127.031	0.847	0.000	137.210	8.817	0.000
Livestock:	0.422	0.316	0.000	0.363	0.272	0.000
Irrigation:	1.520	1.520	0.000	5.518	5.518	0.000
Golf Course:	1.325	1.325	0.000	1.590	1.590	0.000
Institution:	0.000	0.000	0.000	0.000	0.000	0.000
Domestic.	1.968	0.197	0.000	2.782	0.278	0.000
TOTALS:	216.074	11.733	-1.384	218.601	24.108	-1.455

NEW YORK

Regarding a choice between the GLB Framework Study and 1975 National Assessment figures in the report, New York prefers the National Assessment since they should be somewhat closer to values based on State population projections

PUBLIC REVIEW GROUP COMMENTS

More emphasis needs to be placed on reducing water demand, particularly in areas like Erie where the demand is inordinantly high. - William E Sharpe, Pennsylvania State University.

WORK GROUP RECOMMENDATION

Adopt the National Assessment's projection of volumetric requirements as a part of the State-Regional Future.

The problem of reconciling State projections to the aggregated projections of the Assessment is again evident. It appears that a superior and more detailed methodology was employed by Pennsylvania. However, there is a similarity in projected population growth and the relative amount of water use compared to ASA 07 as a whole is quite small (eg. for 1970, total water use and consumptive use for the Pennsylvania portion only amounted to 4% and 2%, respectively, of the comparable Assessment figures for all of ASA 07 in 1975). Therefore, it is felt that the differences in volumetric projections for the Pennsylvania portion of ASA 07 are not of sufficient magnitude to noticeably skew the projections for the entire ASA.

LAKE ONTARIO REGION - ASA 08

WITHDRAWAL

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

REGION Great Lakes(04)	ASA No 08			AREA (in acres × 1000) 11,120 0			SOURCE Fresh
STATES NY	COUNTIES 20						
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000	
Domestic, Commercial, and Institutional, Total	267 0	313 4	424 9	192 4	219 2	256.5	
Central	233 1	274 5	383 1	162 2	184 1	217 1	
Non-Central	33 9	38 9	41 8	30 2	35 1	39 4	
Manufacturing, Total	517 8	481 2	490 6	325 0	125 8	105 7	
Food and Kindred Products	53 6	55 9	69 1	30 8	14 4	11.0	
Paper and Allied Products	71 0	48 0	44 6	115 7	47 9	37 1	
Chemical and Allied Products	184 0	184 4	181 5	39 8	9 9	8 1	
Petroleum Products	---	---	---	---	---	---	
Primary Metals	129 0	94 4	47 5	51.0	9 0	5 0	
Others	80 2	98 5	147 9	87 7	44 5	44 5	
Minerals, Total	16 1[1]	26 5	46 1	59 4	76 8	106 2	
Metals	---	---	---	10 2	11 4	13 5	
Non-Metals	---	---	---	48 9	65 1	92 4	
Fuels	---	---	---	0 3	0 3	0 3	
Irrigation, Total	13 2	26 7	47 0	---	---	---	
Crops	5 6	11 8	22 1	13 0	17 2	21 9	
Other	7 6	14 9	24 9	---	---	---	
Livestock	18 3	22 7	28 1	13 8	14 4	15 2	
Steam Electric[3]				2321 0	4814 0	7536 0	
Case I[2]	1783 6	5702 4	7997 6				
Case II	1783 6	5702 4	3791.8				
Public Lands	---	---	---	0 0	0 0	0 0	
Total Case I	2616 0	6572 9	9034 3	2924 6	5267 4	8041 5	
Case II	2616 0	6572 9	4828 5				

1 1968 value
2 For Framework Study steam electric water use, Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31, 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment s Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

LAKE ONTARIO REGION - ASA 08

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

CONSUMPTIVE USE

REGION. Great Lakes(04)	ASA No 08			AREA (in acres x 1000) 11,120 0			SOURCE Fresh
STATES NY	COUNTIES 20						
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000	
Domestic, Commercial, and Institutional, Total	29 2	34.3	45 5	45 9	52 4	60 4	
Central	23 4	27 4	38 4	27 5	31 3	36 9	
Non-Central	5 8	6 9	7 1	18 4	21 1	23 5	
Manufacturing, Total	40 1	55 9	126 3	18 3	33 8	66 7	
Food and Kindred Products	2 7	3.6	4 8	2 7	4 1	6 8	
Paper and Allied Products	10 0	11 9	17 0	4 5	11 8	28 9	
Chemical and Allied Products	11 6	20 5	71 6	1 8	3 6	6 3	
Petroleum Products	---	---	---	---	---	---	
Primary Metals	10.7	11 9	14 8	1 0	2 0	4 0	
Others	5 1	8 0	18 1	8 2	12 3	20 5	
Minerals, Total	5 4[1]	7 2	13 7	8 4	10 5	14 4	
Metals	---	---	---	1 5	1 5	1 8	
Non-Metals	---	---	---	6 6	8 7	12 3	
Fuels	---	---	---	3	3	3	
Irrigation, Total	9 9	20 0	35 3	---	---	---	
Crops	4 2	8 8	16 6	9 4	12 6	16 2	
Other	5 7	11 2	18.7	---	---	---	
Livestock	16 6	20 4	25 4	13 8	14 4	15.2	
Steam Electric[3]				16 0	31 0	153 0	
Case I[2]	21 8	43 6	61 4				
Case II	21 8	43 6	62 8				
Public Lands	---	---	---	0 0	0 0	0 0	
Total Case I	123 0	181 4	307 6	111 8	154 8	325 8	
Case II	123 0	181 4	309 0				

1 1968 value
2 For Framework Study steam electric water use Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment & Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

LAKE ONTARIO-ST LAWRENCE REGION - ASA 08

NEW YORK

Regarding a choice between the GLB Framework Study and 1975 National Assessment figures in the report, New York prefers the National Assessment since they should be somewhat closer to values based on State population projections

WORK GROUP RECOMMENDATION

Adopt the National Assessment's projection of volumetric requirements as a part of the State-Regional Future.

GREAT LAKES REGION - ASA 01-08

1975 NATIONAL ASSESSMENT — WITHDRAWAL
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

RESPONSE FORM

REGION Great Lakes (04)	ASA No 01-08	AREA (in acres x 1000) 85,905 9	SOURCE Fresh
STATES 8	COUNTIES 190		

FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	3,467 4	4,067.5	5,310 9	3,266 9	3,597 5	4,042 5
Central	3,093 2	3,661 6	4,834	2,945 1	3,247 0	3,682 4
Non-Central	372 6	404 0	475.3	321 8	350 5	360 1
Manufacturing, Total	11,890 8	9,457 7	9,346 1	12,815 8	3,977 8	2,702 9
Food and Kindred Products	352 1	335 4	398 2	354 0	152 9	115 7
Paper and Allied Products	916 4	698 2	983	966 5	499 1	394 2
Chemical and Allied Products	1,905 8	2,145 6	3,198 0	1,940 2	425 8	334 4
Petroleum Products	566 0	569 0	579 0	822 2	210 1	91 4
Primary Metals	6,438 2	3,950 4	2,079 3	7,011 0	2,062 0	1,200 0
Others	997 6	1,097 5	1,462 2	1,722 0	628 1	566 9
Minerals, Total	727 4[1]	844 8	1,084 4	696 6	830 7	1,044 3
Metals	--------	--------	--------	231 0	251 1	288 0
Non-Metals	--------	--------	--------	450 9	562 2	735 3
Fuels	--------	--------	--------	14 7	17 4	21 0
Irrigation, Total	186 7	400 1	609 8	--------	--------	--------
Crops	95 4	235 1	328 0	175 5	255 4	339 5
Other	91 3	165	281 8	--------	--------	--------
Livestock	98 8	131 0	174 4	83 4	84 8	87 0
Steam Electric[3]				22,339	22,356	16,421 0
Case I[2]	17,213 2	31,454 8	104,168 8			
Case II	17,213 2	15,731 3	6,467 7			
Public Lands	--------	--------	--------	37 2	48 3	58 5
Total Case I	33,944 3	46,355 9	120,394 4	39,414 6	31,150 4	24,695 7
Total Case II	33,944 3	30,632 4	22,693 3			

1 1968 value
2 For Framework Study steam electric water use, Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31, 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries), National Assessment's Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore, additional generating capacity may be reflected in the Assessment numbers

GREAT LAKES REGION - ASA 01-08

CONSUMPTIVE USE

1975 NATIONAL ASSESSMENT
State-Regional Future
VOLUMETRIC REQUIREMENTS
(Million gallons per day)

RESPONSE FORM

REGION Great Lakes (04)	ASA No 01-08		AREA (in acres x 1000) 85,905 9			SOURCE
STATES 8	COUNTIES 190					Fresh
FUNCTIONAL USE	GLB Framework Study 1970	1980	2000	1975 National Assessment 1975	1985	2000
Domestic, Commercial, and Institutional, Total	371 8	437 9	560 1	531 8	580 2	632 9
Central	309 3	370 0	482 5	335 7	369 4	418 3
Non-Central	62 5	67 9	77 6	196 1	210 8	214 6
Manufacturing, Total	992 5	1424 5	3224 7	1456 9	1698 6	1965 1
Food and Kindred Products	51 6	60 0	78 6	37 7	48 6	68 4
Paper and Allied Products	128 5	174 9	323 1	132 9	200 8	309 2
Chemical and Allied Products	177.3	341 7	1255 5	62 4	123 0	254 0
Petroleum Products	87 9	150 1	349 9	58 2	83 1	70 8
Primary Metals	427 2	509 2	702 9	1026 0	1046 0	951 0
Others	71 3	105 3	225 6	139 7	197 2	311 5
Minerals, Total	75.5[1]	118 3	190 9	152 3	174 1	210 2
Metals	-----	-----	-----	83 6	91 0	101 4
Non-Metals	-----	-----	-----	60 2	73 5	97 8
Fuels	-----	-----	-----	8 4	9 6	12 0
Irrigation, Total	140 2	300 0	457 4	-----	-----	-----
Crops	71 9	176 2	245 8	137 8	204 7	281 2
Other	68 3	123 8	211 6	-----	-----	-----
Livestock	89 2	117 8	157 6	83 4	84 8	87 0
Steam Electric[3]				169	449	1259
Case I[2]	164 1	271 0	826 6			
Case II	164 1	338 1	1251 9			
Public Lands	-----	-----	-----	15 6	22 5	30 3
Total Case I	1962 9	2669 5	5417 3	2546 9	3214 0	4462 7
Total Case II	1962 9	2736 6	5842 6			

1 1968 value
2 For Framework Study steam electric water use, Case I assumes all flow through cooling except for known supplemental cooling systems as of December 31 1970 Case II assumes all supplemental cooling except for known flow through systems as of December 31 1970
3 Framework Study considered generating capacity within the Great Lakes Basin (hydrologic boundaries) National Assessment's Great Lakes Region and ASA's are defined along political jurisdictions (county boundaries) Therefore additional generating capacity may be reflected in the Assessment numbers

NON-VOLUMETRIC REQUIREMENTS

Non-volumetric requirements have been defined for purposes of the Assessment to include uses of water and related land resources which do not involve withdrawal or consumptive use of water. This section contains narrative descriptions of these resource issues, as well as tables displaying present and future needs, opportunities, and projected damages The tables have been reviewed by the Great Lakes National Assessment Work Group and the numbers presented reflect their preferences and the recommendation of the Great Lakes Basin Commission staff. For recreation-related needs (outdoor recreation, sport fishing, recreational boating, and wildlife management), Framework Study projections of need are presented in parentheses as a point of comparison The manner in which the Framework Study projected recreation needs were adjusted to a Series E population base is described in the following paragraphs

The needs projected in the Framework Study for water oriented outdoor recreation (recreation days), sport fishing (angler days), recreational boating (boat days), and wildlife management (user days) were based on assumptions which are explained in Appendixes 8, R9, 17, and 21. A basic assumption was the use of OBERS Series C population projections to calculate the "effective population" which is expected to contribute to recreation requirements. The methodology takes into account recreational users residing in various parts of the Great Lakes Region and considers those residents from adjacent regions who have an impact on recreational resources.

The methodology used in the 1975 National Water Assessment only considered the resident population of an ASA in calculating recreation requirements This limited approach tends to produce misleading demand projections in that travel to popular recreation areas in other ASAs is ignored. The requirements for a sparsely populated area like the Lake Superior Region are therefore understated, and in heavily populated urban areas they are greatly overstated. Because the Framework Study estimated recreation-requirements in a more comprehensive manner, it was felt that adjustment of those projections to reflect a slower rate of population growth would be more realistic than the Assessment figures. Therefore, the following methodology was used to approximate recreation needs based on OBERS Series E population projections. These needs are being considered for adoption in the Assessment.

A ratio of Series E to the Framework Study population (approximately Series C) was calculated for each projection year to be used as a multiplier for conversion from Series C to Series E. A single Series E/Series C multiplier was calculated for the entire Great Lakes Region and used to develop alternative projections for each ASA Although it might be desirable to use a different multiplier for sub-regions of the Great Lakes area, the mechanics of such an operation are unnecessarily involved and the results would appear more accurate than justified

The multipliers for the projection years 1980 and 2000 are calculated below.

$$\frac{\text{OBERS Series E population for the Great Lakes Region}}{\text{Framework Study (approx. Series C) population for the Great Lakes Region}}$$

$$= \frac{31,913,900}{33,566,246} \approx 0.95 \qquad (1980)$$

$$= \frac{36,745,700}{42,338,176} \approx 0\ 87 \qquad (2000)$$

OBERS Series E projections were adjusted to the Great Lakes Study Area as defined in the Framework Study by Waldon Miller and John Putman in Economic, Demographic, and Land Use Projections, January, 1975 For each ASA, the total demand at 1980 and 2000 was multiplied by 0 95 and 0 87, respectively, to arrive at projections which would be consistent with the Assessment's Series E population assumption. Needs are then calculated by subtracting base year (1970) supply from demand

For agricultural and forest land treatment and shoreland and streambank erosion, the figures for each year represent opportunities for alleviating the problems or damages on the specified number of acres or miles (shoreland or streambank). These categories are not addressed in the Assessment and the opportunities indicated in the tables are those that were developed for the Framework Study A damage assessment survey of shoreline erosion for the recent episode of high Great Lakes water levels (1972-1974) is currently being conducted by the U S. Army Corps of Engineers and will be used to update the shoreland erosion figures

The Soil Conservation Service and Corps of Engineers projected damages to 1985 and 2000 for alternative levels of flood plain regulation (1) flood plain management to remain constant, (2) flood plain regulation adoption rate to continue, and (3) regulate flood plain to the maximum practical extent. After examining data and investigating likely trends in flood control work, a fourth alternative was developed which reflects damage reduction of .4% per year of damages remaining after regulation trend continuance. The major premise was that structural measures need to be melded with nonstructural measures to arrive at a most likely future. Flood plain management--structural measures and/or regulation--is not likely to continue at a rate experienced in the recent past The mix is likely to be different, ie , less structural measures and more regulatory measures The projected damages in the tables are based on the assumption that structural measures will continue to be installed at a slower rate, and the present trend in regulatory measures will continue at a faster rate. Accordingly, the most probable average annual flooding damages were projected for 1985 and 2000.

For cropland drainage, the following assumptions were made in the Assessment. Farmers have historically converted wet soils previously used for pasture and forest land to cropland according to their expected costs and returns. This situation is expected to continue in the future as Congress and State legislative bodies show little inclination to impose controls on privately owned rural land. Class IIw and IIIw wet soils are assumed to be convertible to cropland at their historic rate of conversion up to 90% of the remaining balance of IIw and IIIw pasture and forest land identified in the 1967 CNI (Class IIw and IIIw are Soil Conservation Service classifications of wet soils with limitations for cropland use which are moderate and severe, respectively.) The projected conversion will depend on the level of commodities demanded and the cost of draining and clearing the wet soils.

This section is arranged according to lake basin and aggregated subareas (ASA) Issues of basinwide concern are presented along with references to particular ASAs. Within each ASA discussion, mention of specific subareas is sometimes made. Because the Assessment's numbering system and the relationship between ASAs and subareas can be confusing, the following table and the lake basin maps should be consulted.

Aggregated Subarea (ASA). . . composed of. . . .	Subareas
01	0401, 0402
02	0403
03	0404
04	0405, 0406
05	0407, 0408
06	0409, 0410
07	0411, 0412
08	0413, 0414, 0415

LAKE SUPERIOR REGION - ASA 01

WATER QUALITY

The importance of maintaining Lake Superior in its relatively uncomtaminated state cannot be overemphasized. The Lake is much colder than other of the Great Lakes and its assimilative capacity if lower Since the processes by which various types of pollutants are broken down proceed more slowly in Lake Superior, it is more susceptible to degradation by such pollutants. Lake Superior provides a source of clean water to the downstream lakes The pollution problem of Lake Erie might be considerably worse it it were not for the clean water available from Lake Superior.

Due to water circulation patterns, the apparently localized sources of pollution can affect other uses throughout the entire Lake area. Because of the delicate nature of Lake Superior, it behooves users to take steps to preserve the high water quality of the Lake by thoroughly treating all shipping wastes, by the containment of dredge spoil, and by compliance on the part of the municipal and industrial dischargers with Federal water quality standards.

In terms of requirements for treatment of wastewater discharges, there were about 44.7 mgd of municipal effluents and about 55.2 mgd of industrial effluents in the Lake Superior basin in 1970. Major pollution problems are traceable to effluents from mining and forest products industries, and to the lack of tertiary or, in some cases, secondary treatment by both public and private wastewater disposal systems Because of the variance in treatment (or no treatment) for point sources of wastewater such as industry or municipal outfalls, and complexitites associated with nonpoint sources such as agricultural or mining areas, an accurate summary of the status of wastewater treatment cannot be made.

The single largest United States source of industrial effluent comes from Reverve Mining Company taconite plant at Silver Bay, Minnesota, which for several years has discharged approximately 67,000 long tons of taconite tailings into Lake Superior daily As a result of a suit filed by the Department of Justice in behalf of EPA and joined by several States, the discharge into the lake is to be stopped and onland disposal instituted.

In 1974 the following areas in Lake Superior did not meet one or more of the International Joint Commission Water Qaulity Objectives as established according to the 1972 U S -Canada Water Quality Agreement Silver Bay, St Louis River (boundary water at the mouth of the river), Duluth Harbor (Minnesota and Wisconsin), the area from Duluth to Sand Point, Chequamegon Bay, and the area from Chequamengon Point to the Montreal River

COMMERCIAL AND SPORT FISHERY

It is only in recent years that the sport fishery catch has outstripped the once-substantial commercial fishing catch in Lake Superior. At the present time, sport fishing brings about four times as much income to the region as does commercial fishing. It is expected that this trend will continue The many opportunities for sport fishing in the area are dominated by coldwater species Fishing access, a continuing sea lamprey problem in Lake Superior, low productivity, and poor wintering habitat of some inland waters, and depletion of some species are problems.

Lake Superior is an oligotrophic lake with relatively few fish species In a simple ecosystem such as this, the abundance of one species can have an immediate and dramatic effect on the survival, growth, and/or abundance of another. Furthermore, recent research has indicated that the fish of oligotrophic lakes are much more likely to concentrate contaminants such as mercury and persistent pesticides than fish found in eutrophic lakes. Given this delicate ecological balance in Lake Superior, it becomes of utmost importance to have intensive and intelligent fish management programs.

Various stocking programs involving primarily salmonid species have provided revitalization of fishing opportunities in Lake Superior. These programs are carried out by the States of Minnesota, Wisconsin, and Michigan Since fish often move freely throughout the lake, it would be desirable to have greater coordination of the fish stocking efforts among the States in order to avoid duplication and potential over-stocking Given the relatively large number of salmonid species in Lake Superior, it is important to continue lamprey control programs. If such programs are not carried out in all portions of Lake Superior, the efforts of fish managers in some areas will be nullified by the continued availability of lamprey habitat in other areas.

While direct coordination of management efforts is essential to maintain the quality of the Lake Superior fishery, it is also important to prevent the degradation of Lake Superior by the introduction of pollutants. The potential importance of sport fishing and the delicate nature of Lake Superior (in terms of the susceptibility of fish to pollutants) may justify even more stringent water quality standards for municipal and industrial discharges than now exist.

OUTDOOR RECREATION

An analysis of the recreational demand and supply for each of the target years indicates that no need exists for additional acerage through year 2000 for several activities, and only moderate needs for the remaining activities However, this is a somewhat distorted conclusion because it was not possible to quantify the directional patterns of travel in the methodology used for estimating requirements. The actual situation, as indicated by studies made by the States of Wisconsin and Minnesota, is that there is very heavy travel north from the urbanized area around Chicago and Milwaukee, as well as from outside the Basin, to make use of the extremely desirable recreation areas in the Lake Superior basin. Not only does the direction of travel influence the requirements in this area, but the quality of the recreation experience has led people habitually to drive farther than they normally would, and farther than was considered in the methodology Thus, the needs for the target years for almost all forms of recreation are believed to be understated

A significant part of the need is to serve urban residents. Presently undeveloped portions of existing recreation areas in or near urban centers could be developed to meet a part of this need. In addition to the general problems of meeting recreation needs, there are some specific problems related to unique high quality recreational opportunities Some wilderness areas are being subjected to excessively heavy use, and the beauty of the wilderness in the vicinity is being threatened with severe degradation Concentrations of visitiors at a limited number of acess points accentuate the problem Large areas of potentially desirable recreational land have been disturbed in connection with the extensive mining of iron ore in Minnesota. The large open-pit excavations and huge piles of spoil detract from the aesthetic qualities of the area

RECREATIONAL BOATING

A program providing for the establishment of new small boat harbors is essential to the expansion of recreational boating opportunity throughout Lake Superior The introduction of coho salmon in Lake Superior, and the restocking of other salmonid species such as lake trout, have improved the sport fishery considerably, concurrent with the expansion of recreational boating Since the nature of boating activity is such that rather large distances are frequently covered, it is essential that a system of small boat harbors be developed. Lake Superior experiences frequent storms which are often severe. While the shoreline is not always amenable to the construction of such facilities (due to its rock character), there are enough sites to provide harbors an average of 15 to 20 miles apart Improvements in the system of communicating weather conditions to boaters are also important if the harbors are to be used with greatest effectiveness.

One of the main problems in Subareas 0401 and 0402 is that some of the existing inland waters are overused at the present time for recreational boating. The lack of stream improvement, lack of maintenance, inadequate access to inland lakes, and periodic low flows limit small boat opportunities and the amount of canoeing on some inland waters. The influx of nonresident boats into the area is extremely high each season and is steadily increasing In addition to making water surfaces available to boaters, it is necessary to provide berthing facilities, launching sites, access, and navigational aids.

COMMERCIAL NAVIGATION

The somehwat economically depressed nature of the Lake Superior region and the importance of commercial navigation to the regional economy make it likely than any improvement in the navigation system of the Great Lakes would benefit the economy of the Lake Superior region. At the same time, such improvements, if realized, must be developed with adequate environmental safeguards in order to insure that recreational uses (another major economic sector of the region) of the lake will not be impaired.

LAND TREATMENT AND DRAINAGE

In 1970, the agricultural land that needed treatment amounted to 472,900 acres, consisting of cropland, pasture, and other lands Approximately 314,700 acres, about 45% of all cropland, is now receiving adequate land conservation treatment and management Needed measures include improved management and use of agriculture and forest lands, which would enhance economic growth and environmental quality, and institution of conservation treatment practices on agricultural and forest lands. In Subarea 0401, agriculture is marginal at present and is projected to decline further in the future There are approximately 105,000 acres of agricultural land in Subarea 0402 on which production is presently reduced or limited by excess water in the soil profile.

Current forest land treatment and management programs have contributed to the adequate treatment and management of 7,784,000 acres of national, State, county, and private forest land in the region, or 54% of the total forest land. Forest land is predicted to decrease due to highway, power line, reservoir, urban, recreational, and

industrial developments. Unless strong action is undertaken to halt the accelerating deterioration of the natural environment, rehabilitation of the forested land will be very costly, if not impossible Some other needs in this ASA are means of securing good management for private forest lands and protecting and establishing trees and shrubs in areas surrounding urban and built-up areas.

SHORELAND EROSION AND MANAGEMENT

Some shore erosion protection measures have been provided by the Corps of Engineers under its beach erosion control authority, but mostly private shore property and commercial interests have constructed seawalls, riprapping, and cribbing on scattered reaches of the shoreline. There are 118.2 miles of Lake Superior shoreline with erosion problems in Subarea 0401, with 13.5 miles subject to critical erosion and 104 7 miles subject to noncritical erosion The total shoreline in this area is 336.2 miles, of which 0 5 miles are protected. The total shoreline in Subarea 0402 is 575 8 miles, of which 4.9 miles are protected, 15.2 miles are subject to critical erosion, and 23 2 miles are subject to noncritical erosion

It can be anticipated that these 1971 estimates of shoreline miles subject to either critical or non-critical erosion would be higher now because of further development of shorelands, higher lake levels, and island shores (the Apostle Islands) known to be eroding, but which were not included in the 1971 National Shoreline Study Erosion mileage figures may now be double the figures given here.

STREAMBANK EROSION

Streambank erosion is severe in some of the tributaries to Lake Superior Besides being detrimental to water quality, erosion hastens the loss of existing land and agricultural and urban improvements. Along streams which drain less than 400 square miles, there are 904 bank miles subject to moderate streambank erosion damage and 469 miles subject to severe streambank damage. The annual damage is estimated at $252,600 per year, principally due to land losses. For streams draining more than 400 square miles, there are an estimated 57 bank miles of severe streambank erosion with about $12,000 damage annually Most of this damage is from sedimentation.

The greatest streambank erosion problem in Subarea 0401 is in northwestern Wisconsin. In Subarea 0402 streambank erosion is most critical on private land in the Keweenaw and Grand Marais complexes To reduce erosion and sedimentation, more regulation is needed in highway, urban, and suburban construction programs and in logging.

FLOOD DAMAGES

The greatest flood damages in Subarea 0401 occur in the urban area, although the agricultural lands are also subject to considerable damage. Most of the average annual urban damages occur in the Duluth area, while the Bad River drainage area also experiences significant damages Three-fourths of the average annual rural damages occur in the St. Louis River basin In Subarea 0402, major urban damages occur in the Ontonagon River basin and Sturgeon River basin The latter basin accounts for 94% of the rural average annual damages. The major problems are encroachment of the natural flood plain areas, the lack of local flood plain zoning and regulation, constricted river reaches, inadequate channel capacity, or a combination of these causes.

WILDLIFE MANAGEMENT

There appears to be an adequate supply of land and habitat to satisfy wildlife needs in spite of a shrinking resource base. Wildlife habitat land is being allocated to other uses. In some cases, land in Subarea 0401 is not managed as well as it could be for multiple uses including wildlife conservation An additional acute problem, particularly in the St. Louis River basin, is the need for preservation or protection of the remaining wetlands in the area To meet the projected needs of the next 50 years, an additional 50,000 acres should be considered for wildlife management and habitat development.

AESTHETIC AND CULTURAL RESOURCES

Many existing aesthetic and cultural values are in need of preservation. Cities, such as Duluth, Hibbing, and Virginia, Minnesota, Superior and Ashland, Wisconsin; and Ironwood, Houghton, and Marquette, Michigan face some urban expansion. Environmental corridors merit consideration in this area. At the present time, institutional arrangements and funding are not available to meet these objectives The Lake Superior shore is important enough to warrant immediate steps for preservation.

NON-VOLUMETRIC REQUIREMENTS[1]

REGION. Great Lakes (04)	ASA No.. 01	AREA (in acres x 1000)· 16,998 4		
STATES. MN, WI, MI	COUNTIES. Minnesota(4), Wisconsin(4), Michigan (9)			
Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]—Base Year (1970) to 1980	Needs[2]—Base Year (1970) to 2000
W.O. Outdoor Recreation[3]	1000 rec. days	8,820	+(+)	+(+)
Sport Fishing[3]	1000 angl days	7,090	583(987)	966(2,170)
Recreational Boating[3]	1000 boat days	2,270	156(284)	56(403)
	1000 acres W S.[4]	1,800	1,800	1,800
Wildlife Management[3]	1000 acres		0	60
	1000 user days	3,020	+(82)	+(68)
Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year[5]		
		1970	1980	2000
Agr. Land—Treatment	1000 acres	473	473	473
Forestland—Treatment	1000 acres	10,000	10,000	10,000
Shoreland Erosion[6]	miles	156	156	156
Streambank Erosion	miles	1,430	1,430	1,430
	$1000 AAD[8]	254	254	254
Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year[7]		
		1975	1985	2000
Flood Plains —Urban	$1000 AAD[8]	697	787	923
—Rural	$1000 AAD[8]	275	312	378
Cropland Drainage	1000 acres	---	117[9]	117[9]

1 From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
2 Additional resource requirements beyond 1970 requirements
3 For the Assessment, projections were derived by adjusting Framework Study projections to reflect a Series E growth level Framework Study projections, using Series C population growth, are in parentheses
4 Opportunities
5 All figures are from the Framework Study
6 The Corps of Engineers is currently conducting a shoreline damage survey for the recent period of high Great Lakes water levels (1972-1974)
7 Unless otherwise noted, all projections were developed for the 1975 National Water Assessment
8 Average Annual Damages
9 Based on comments on draft SRF report, Framework Study estimates of drainage opportunities are presented for ASA 01

LAKE MICHIGAN

WATER QUALITY

Some of the more serious water quality problems in Lake Michigan itself exist in the Green Bay area, southern Lake Michigan, and in the Grand Traverse Bay area Major pollution problems are traceable to the effluents from forest products industries in the northern portion of the basin, to the lack of tertiary treatment, and in many cases, secondary treatment, in both public and private wastewater disposal systems, and to drainage from agricultural, urbanized, and natural lands Because of the variance in treatment (or no treatment) for point sources of wastewater, and the complexities of nonpoint sources, a summary of the exact status of wastewater treatment cannot be made. The growth of algae from nutrients has caused nuisance conditions in locations on the southern end of Lake Michigan, although recent improvements have significantly reduced the problem. This problem can be partially relieved by adequate treatment facilities Sedimentation, thermal input, watercraft discharge, and oil spills detract from the water quality of the lake

It is difficult to overemphasize the importance of high quality water to meet the needs of the large population on the shores of Lake Michigan Furthermore, there is a real possibility of passing pollution thresholds in certain areas of the lake For these reasons, an expanded water quality monitoring program throughout the lake is needed Such a program will provide information for wise water management and will assist in the enforcement of water quality standards and regulations In 1974 the following areas in Lake Michigan did not meet one or more of the International Joint Commission Water Quality Objectives Green Bay area, Milwaukee Harbor and the Indiana Harborship channel and inner harbor basin.

COMMERCIAL AND SPORT FISHERY

Current fisheries programs involve protection and improvement of natural resources, direct manipulation of fish population, maintenance planting, and some indirect continuing control of the sea lamprey While both sport and commercial fisheries are affected in Lake Michigan, the latter is subordinated to the former at the present time Occasionally the alewife die-off creates problems along the beaches of Lake Michigan

Various programs by the States bordering the lake for stocking salmonid species have revitalized fishing opportunities Still greater coordination is desirable in order to avoid duplication and potential overstocking Because of the relatively large number of salmonid species in Lake Michigan, it is important to continue lamprey control programs throughout the lake so that the efforts of fish managers in some areas are not nullified by the continued availability of lamprey habitat in other areas Many of the salmonid species are anadromous so that it is important that sport fish management programs be coordinated with programs to protect the quality of the inland streams used by salmonid species for spawning

OUTDOOR RECREATION

Lake Michigan has some of the finest beaches on the Great Lakes, particularly along its eastern shore Of the total of over 3,100 acres, about 1,200 acres are publicly owned and available for use and an additional 1,200 acres in private ownership have some development potential for public use Islands in Lake Michigan that provide an excellent base for recreational use and development include (1) the Green Bay Islands,

containing more than 22,000 acres of land in the northern part of the lake, (2) North and South Manitou Islands, included as part of the Sleeping Bear Dunes National Lakeshore, and (3) the Beaver Islands, an eight-island area which is approximately one-third publicly owned.

In spite of the extensive recreational resources in the Lake Michigan region, there are also many problems associated with recreation here. In the heavily urbanized area, the tendency is for the recreational land to be converted to uses which produce greater income and remove it from the recreation category, thus further depleting the recreational opportunities in this area where they are so badly needed. A notable exception to this trend is the Illinois coastal area where local communities and the State have maintained open space areas in an attempt to meet coastal recreational demands Also, the proximity of the recreation facilities just north of the heavily urbanized areas means that these are quickly overcrowded on weekends and holiday periods by persons moving into them from the cities. Traffic problems are almost as great as the problems at recreation facilities themselves.

RECREATIONAL BOATING

The demand for recreational boating opportunities has increased markedly in the Lake Michigan basin Small boat harbors hare not always spaced closely enough for boaters to have ready access to a sheltered port. More berthing facilities are also needed at the harbors. Construction of new harbors and expansion of public access and existing facilities are needed in some areas Also, facilities on the Wisconsin shores for pleasure craft to empty their sewage holding tanks are very scattered, expensive, and usually too busy to accommodate the large number of boats. Because of this lack of facilities, much sewage is dumped into Lake Michigan Because of heavy use in the southern portion of the basin, the boating opportunities in the northern portion are becoming more popular New construction here is essential if the needs are to be met Systems for providing weather information and other urgent messages to boaters must be developed and installed

COMMERCIAL NAVIGATION

There are 29 Federal commercial harbors and 7 private commercial harbors on Lake Michigan Total traffic handled, including receipts and shipments, is over 100 million tons annually. The Commercial and industrial development around the southern end of the lake has built up largely on the base of water transport The importance of commercial navigation to most portions of the Lake Michigan basin is such that improvements in the navigation system would benefit the economy of the region

SHORELAND EROSION AND MANAGEMENT

Of the 1,362 miles of Lake Michigan shoreline, about 590 miles were classed in 1970 as subject to erosion. Estimates for 1973 conditions are greater For the State of Michigan, about 450 miles were classed as "high risk" in 1973, compared with 80 miles critical and 300 miles noncritical in 1970 (Critical erosion implies economic consequences great enough to warrant protective measures High risk connotes probability of occurrence) Structural protective measures have been provided by the U.S. Army Corps of Engineers under its authority for beach erosion control and by private and commercial shore property owners. Erosion mileage figures may now be double the previous estimates for Wisconsin. It should also be noted that shoreline mile figures do not include the Green Bay Islands shorelines.

At present, the use and development of the shorelines in northwestern Indiana and eastern Illinois is a mixture of open space, residential, and commercial and industrial. Of the 59 miles of shoreline in Illinois, approximately 50 percent is used for open space, 25 percent for residential purposes, and no more than 10 - 15 percent for commercial and industrial uses This use gives way to permanent and seasonal residential development north to an approximate line from Frankfort, Michigan, to Sturgeon Bay, Wisconsin. From this line northward, including the Upper Peninsula of Michigan, the shoreline has less development, with agricultural and forest lands predominating Conflicts of use are apparent in various degrees along each type of shoreland

WILDLIFE MANAGEMENT

Lake Michigan shoreland includes approximately 175,000 acres of shoals and wetlands Some 140,000 acres are considered to be extremely important fish and wildlife habitat While the open waters of the lake are used primarily as waterfowl resting areas, shoals and marshes are used for resting, nesting, and feeding The Lake Michigan basin is one of the most important basins in the production of waterfowl in the Great Lakes Basin.

NORTHWESTERN LAKE MICHIGAN REGION - ASA 02

WATER QUALITY

Problems in ASA 02 relate primarily to the impact of people on land and water. Waste treatment facilities have not kept pace with growth and stream quality has been degraded Increasing amounts of sediment and nutrients are being added to the streams and lakes from urban growth, highway construction, improperly maintained streambanks and lakeshores, and agricultural activities adjacent to the streams or lakes The popularity of many of the lakes for recreation and permanent home sites has caused lake pollution and pollution of the ground water aquifers This water quality deterioration has expanded also to Lake Michigan itself, principally in the Green Bay area. Water quality limited segments are Green Bay, southeast from the navigation channel and southeast from the north line of Brown County, and the Fox River from the upper dam at Appleton to Green Bay

The problem of unsatisfactory water quality indicates the most significant aspect of nonwithdrawal water uses, that of the need for treatment of wastewater, both municipal and industrial There are no peculiar problems associated with this need, except that industries, such as wood pulp or food products, generate very high oxygen demand in the wastes Techniques for adequate treatment are available.

COMMERCIAL AND SPORT FISHERY

The inland lakes and upland streams provide high quality fisheries, but the deteriorated water quality in the lower reaches of the rivers prevents fisheries from developing in this area This is one of the problems which must be resolved The commercial fishery is faced with the usual problems in the Great Lakes--the question of management alternatives, the competition for riparian lands where shore-based facilities could be established, and the need for technological improvement in fishing gear and processing techniques The basic question is the way in which commercial fishing will be handled as part of the total fishery management in the Great Lakes Basin

OUTDOOR RECREATION

ASA 02 has a wealth of water area and outdoor recreational opportunities, but it has the usual problems involving competing land use, pollution, and questions of recreational development or preservation and protection. There are no particular problems associated with providing additional recreational facilities, but the acquisition and management of the resource is a major undertaking.

RECREATIONAL BOATING

The high quality recreational boating in the area attracts a large number of people, adding to the already high concentration of local boaters. There are opportun-

ities for additional development on inland waters, including the portion of the Fox River between Lake Winnebago and Green Bay, which was initially improved in the interest of commercial navigation and which may now be available for recreational boating Development of suitable facilities along the Lake Michigan shore is also a possible solution.

COMMERCIAL NAVIGATION

Commercial navigation will be influenced by the overall treatment of this resource throughout the Great Lakes Basin. Major receipt in the area has been coal, and the principal shipments have been lumber, newsprint, pulp, and paper It is not anticipated that changes in the size of ships or the length of navigation season will significantly affect this area

LAND TREATMENT AND DRAINAGE

No peculiar problems exist in the area. The maintenance of the soil resource in the agricultural area is one which requires constant surveillance. Treatment measures are needed on over 2 million acres of agricultural land. There are areas where excess water on the surface or in the soil profile is a problem. Based on the historic rate of wet soil conversion to cropland (see P 113, last paragraph), no additional drainage is projected for this ASA

The long-term trend in forest land is toward a declining acreage, as forest land gives way to highways, power lines, reservoirs, and urban, recreational, and industrial developments The challenge is to satisfy increasing demand for goods and services from a declining forest resource base. All of the acreage now available will be needed in the future Management efforts and forest land treatment must be intensified

SHORELAND EROSION AND MANAGEMENT

Shoreline erosion is not a serious factor in this aggregated subarea. Of the 365 miles of shoreline, there are no critical erosion problems and 149 miles are subject to noncritical erosion These figures are based on 1970 conditions.

STREAMBANK EROSION

Moderate or severe streambank erosion occurs on 1,358 bank miles, with average annual damages estimated at $196,000. Damage results from accelerated streambank erosion which hastens the loss of existing land and the natural resources, agricultural improvements, or the urban developments on this land. Damage also results from the sedimentation process on downstream structures and fish, wildlife, water supply, and recreational resources.

FLOOD DAMAGES

Flooding may occur at any time, but generally, the major floods are the result of rain and/or snow melt on frozen or nearly saturated ground. A few intense summer storms have caused destructive floods. Overbank flooding is also caused by ice jams. Conditions vary among the different streams, and both structural and institutional measures must be considered.

WILDLIFE MANAGEMENT

Population growth, hunting pressure from the Milwaukee-Chicago area, and a reduction in the resource base underlie the problems in ASA 02. Wildlife management programs and habitat protection are needed.

AESTHETIC AND CULTURAL RESOURCES

Environmental buffer zones adjacent to expanding urban centers are in immediate need of study and planning attention to insure proper use of their significant resource features

SOUTHWESTERN LAKE MICHIGAN REGION ASA 03

WATER QUALITY

There are numerous manufacturing establishments and a substantial dairying activity in the Wisconsin portion of ASA 03. In 1970, about 1,500 Wisconin people were served by municipal treatment plants which handled wastewater flows of 211 mgd. In addition, industrial flows in 1970 were about 3,274 mgd. Water quality limited segments in the Wisconsin portion of ASA 03 are Honey Creek, Indian Creek, Kinnickinnic River, Lincoln Creek, Menomonee River (below confluence with Honey Creek), Milwaukee River (downstream from the North Avenue Dam), and South, Menomonee, and Burmham Canals in Milwaukee County; Underwood Creek in Milwaukee and Waukesha County; Pine Creek in Kenosha County, and the Pike River in Racine County.

There are no signinficant waste discharges into Lake Michigan from the Illinois portion portion of ASA 03, except for the North Shore Sanitary District, which is under order to divert its effluent from Lake Michigan No municipal discharges are anticipated in the future There are small industrial waste discharges to the lake

The Indiana portion of ASA 03 is the most highly industrialized area of the State with five of the nation's major steel plants, four major oil refineries, and other heavy manufacturing and chemical industries Wastewater discharges from the Hammond, Indiana area into the Upper Mississippi River Basin are not considered as part of this study In 1970, about 340,000 Indiana people were served by municipal treatment plants which handled wastewater flows attributable to the Lake Michigan basin of 114 mgd. In addition, the 1970 industrial wastewater flows were about 3,000 mdg into the Lake Michigan basin. Streams and stream segments classified by the State of Indiana as water quality limited are the Calumet River, Trail Creek, Deep River, and the eastern portion of the Little Calumet River

SPORT FISHING

Needs for sport fishing have been adjusted to consider the existing and potential resource capability of the adjacent areas of the Upper Mississippi River Basin (interbasin transfers). Problems associated with sport fishing include water quality degradation, lack of public access, and a reduction of spawning area brought about by the filling of shoreline marsh areas. There is a specific need to develop a comprehensive, cooperative management plan

OUTDOOR RECREATION

In 1970 ASA 03 generated 26 7% of the Great Lakes Basin's total acreage requirements for water-oriented ourdoor recreation. However, ASA 03 could provide only 1.8% of the Basin's supply. The total recreation requirement for PSA 2 2 was 170 3 million recreation days with the water-oriented recreation requirement at 44.5 million recreation days. By the year 2020 these requirements are projected to be nearly 500 million and 135 million recreation days, respectively

RECREATIONAL BOATING

In 1968, there was an average of over 1.5 registered boats per 100 persons in ASA 03 This does not include canoes, sailboats, and small craft located in the area, the numbers of which are unkown ASA 03 experiences only a moderate influx of nonresident boaters because of the limited area of inland waters and the excessive pressure on the resource base from local boaters The waters of Lake Michigan are not considered safe for boats less than 20 feet in length Recreational boating generally occurs in the vicinity of the 30 commercial and recreational harbors which offer refuge Inland lakes are heavily used. Canoeing is not widely pursued because of the high degree of area development and the poor water quality.

COMMERCIAL NAVIGATION

Major harbors located in ASA 03 include Port Washington, Milwaukee, Oak Creek, Port of Chicago (Chicago Harbor and Calumet Harbor and River), Indiana Harbor, Buffington Harbor, Gary Harbor, and Port of Indiana (Burns Waterway) These ports handle a significant part of the Great Lakes traffic Commerce shipped and received in 1970 amounted to 55.5 million tons of bulk commodities and 6 6 million tons of general cargo. Strong port promotional policies and favorable action to reduce discriminatory rail rates could substantially increase the area's share of grain exports and general cargo At the present time, an extention of the navigation season and improvements to facilitate handling the 1,000-foot vessels are under consideration.

LAND TREATMENT AND DRAINAGE

Approximately 2,170,200 acres of agricultural land, cropland, and pasture in ASA 03 on which conservation practices have not been applied would react favorably to such practices There are about 340,700 acres of forests in ASA 03. The opportunity exists to program for forest land treatment on 212,000 acres as a conservation measure Based on the historic rate of wet soil conversion to cropland (See P. 113, last paragraph), no additional drainage is projected for this ASA.

SHORELAND EROSION AND MANAGEMENT

There are 49.5 miles of shoreline in this ASA subject to critical shoreline erosion and 80.2 miles subject to non-critical shoreline erosion according to the 1971 National Shoreline Study There are no flooding problems associated with the shorelands.

STREAMBANK EROSION

There are 91 bank miles in ASA 03 subject to moderate or severe streambank erosion damage. The total estimated 1970 annual damages resulting from streambank erosion are $32,200

FLOOD DAMAGES

Flood damages have only been estimated for those portions of ASA 03 that drain into Lake Michigan. The greatest flood damages occur in the urban areas, with average annual damages estimated at nearly $9 million in 1970 and projected to increase to $13 million by 1980. Similar figures for rural areas are $230,000 in 1970 and projections of $297,000 by 1980 The urban acreage subject to flooding is on the order of 5,000 acres, and the rural acreage subject to flooding is on the order of 55,000 acres.

WILDLIFE MANAGEMENT

In 1970 there were about 384,100 hunters in ASA 03 and there is need to plan for 670,900 hunters by 1980 The wildlife demand is about 50% consumptive use, or hunting, and 50% nonconsumptive use, or observing, photographing, and otherwise enjoying wildlife One of the greatest problems in this area is the need to set aside and protect areas having considerable value for either feeding grounds or other wildlife habitat use From the standpoint of preserving wildlife opportunities, optimum human population levels have already been exceeded If all of the hunter-day needs are to be satisfied in this ASA, an additional 1,383,600 acres above the 1970 supply of 1,344,680 acres of huntable land will be needed by 1980. About 25% of the total ASA acreage was suitable for hunting in 1970

AESTHETIC AND CULTURAL RESOURCES

The major problems involving aesthetic and cultural resources are the need to preserve outstanding values, industrial and residential use of shoreline which competes with preservation of aesthetic values, and inadequate funds for land acquisition.

EASTERN LAKE MICHIGAN REGION - ASA 04

WATER QUALITY

There are no unusual circumstances relating to municipal or self-supplied industrial wastewater treatment The proportion of industrial wastewater discharges treated by industry is expected to decrease somewhat in the future in view of a trend to provide more recirculation coupled with the trend for industry to have its waste treated in municipal plants

Water quality segments in the Indiana portion of Subarea 0405 are Upper Pigeon Creek, Turkey-Baugo Creeks, and the Upper Elkhart River. In the Michigan portion of Subarea 0405, the following stream segments are classified as water quality limited. Red Cedar River from East Lansing to the confluence with the Grand River, Grand River from Jackson to Jackson-Ingham County line, Grand River from Lansing to Grand Ledge, Sycamore Creek from Mason to the confluence with the Red Cedar River, Kalamazoo River from Comstock to Kalamazoo-Allegan County line including Portage Creek below Cork Street, Battle Creek River from Charlotte to ten miles downstream, and St. Joseph River from Hillsdale to Jonesville. No stream segments in Subarea 0406 are classified as water quality limited

There are many problems within ASA 04 that cause degradation and restriction of uses. These include adequacy and operating efficiencies of municipal sewage treatment plants collecting and intercepting sewers, industrial outfalls, combined sewers,

steam power plants, fertilizers and pesticides from land runoff, and redeposition in open water of dredged bottom sediments There is a need to develop and implement programs for the reduction of agricultural wastes, nutrients, sediments, insecticides, and herbicides.

SPORT FISHERY

Problems adversely affecting the sport fishery are principally related to land use and result from erosion and sedimentation and the runoff from agriculture and other lands. This runoff contains nutrients, and in many cases, pesticides, herbicides, fungicides, and other chemicals, which pose a threat to the fishery resource and to the humans consuming the fish Also, in some areas where real estate developments are being carried out, tributary streams are dammed in connection with the development, reducing the amount of water available for the fish and also blocking the feeder streams used for spawning. Michigan's Dam Construction Approval Act No 184, 1963, gives the Michigan DNR the authority to control this type of activity There is a need for fish passage improvements, fish production through hatcheries, fish population control, habitat improvement and protection, and improved access

OUTDOOR RECREATION

Subarea 0405 attracts many people from outside its boundaries for recreational purposes, especially for weekend and vacation uses Many of these people Chicago and Detroit metropolitan areas and northern Indiana The 1970 land-based water-oriented outdoor recreation developed capacity must be more than doubled by 1980 if needs are to be satisfied. Limited quantities of land are already in public ownership and could accommodate some additional recreational development There are 115,404 acres of State game and wildlife areas within the Michigan portion of Subarea 0405 In the not too distant future, it may be necessary to utilize these public lands more fully and provide some other type of compatible recreational opportunities for the general public in addition to hunting and fishing. Development of other recreational areas to meet the remaining recreational needs in this subarea would involve the acquisition of new land for recreational development, or the exportation of a part of the subarea's recreational requirements to areas further north, or both

There is a wealth of opportunity for outdoor recreation and a great diversity of recreational resources in Subarea 0406 There are no particular problems associated with development, but acquisition and management of the resource is a major undertaking Uncontrolled and mismanaged development can degrade and destroy the resource.

RECREATIONAL BOATING

In addition to making more water surface available to boaters, it is necessary to provide berthing facilities, launching sites, access, and navigational aides in Subarea 0405 One of the main problems in this subarea is inadequate access to many inland lakes. The lack of stream improvement and maintenance and periodic low flows limit small boat opportunities, especially canoeing, on inland waters

There is a quite high participation in boat ownership in Subarea 0406, with about 9.7 registered boats for every 100 residents Possibly 10% of the total number of boats are not registered There is also a very large amount of inland water available for boating, including both lakes and streams which are suitable for boating and canoeing. Harbors and protective waters are relatively plentiful and well-spaced in Lake Michigan.

The adequate supply of inland lakes is relatively little used and principally requires access and launching sites to facilitate increased usage. Berthing facilities will also be required, particularly on Lake Michigan.

COMMERCIAL NAVIGATION

Waterborne commerce handled at ports in Subarea 0405 is relatively small. Continued provision must be made for containment of all polluted dredged spoil and maintenance of the existing systems of harbors and channels. There is no harbor in Subarea 0406 which can be considered a major Great Lakes port However, the nine principal harbors (Muskegon and Ludington are the most noteworthy) handle enough traffic to make commercial navigation a significant consideration in this subarea

LAND TREATMENT AND DRAINAGE

Maintenance of the agricultural base requires constant surveillance and treatment measures There are areas where excess water on the surface or in the soil profile is a problem and drainage will alleviate this problem and permit increased crop production at lower production costs. There is more cropland in Subarea 0405 than in any other in the Great Lakes Basin. However, a decrease is predicted due to increasing pressure to convert the land to other uses. Generally, these other uses reduce the amount of cover on the land and increase the amount of erosion and sedimentation.

There is a long-term trend of decling forest land acreage because of encroachment of highways and urban, recreational, and industrial developments However, it is also expected that some idle cropland will probably revert to forest over a period of time. The challenge is to satisfy increasing demand for goods and services from a declining forest resource base All of the acreage now available will be needed in the future. Management efforts and forest land treatment must be intensified. Unless forest land treatment is undertaken to halt the accelerated deterioration of the natural environment, rehabilitation of the forest land will be very costly, if not impossible. Some other major problems in this ASA involve improved management of private forest lands and protection and establishment of trees and shrubs in areas surrounding urban and built-up areas

SHORELAND EROSION AND MANAGEMENT

The shoreline area of Lake Michigan in Subarea 0405 is one of the most severely eroding areas in the Great Lakes Basin The shoreline consists of sand dunes and sand banks throughout the entire length, and is directly in the path of severe westerly storms and winds. The high lake levels of 1973 have created erosion conditions more severe than those shown in the tables. Along the shoreline of the Upper Peninsula there is no shoreland subject to critical erosion However, along the Lower Peninsula portion of Subarea 0406 there are 42 miles subject to critical erosion and needing treatment

STREAMBANK EROSION

In ASA 04 along streams that have a drainage area of less than 400 square miles, 1,073 miles are subject to moderate streambank erosion damage, and 812 miles are subject to moderate streambank erosion damage, and 812 miles are subject to severe damage The annual damage is estimated at $143,600. For streams draining more than 400 square miles, there are an estimated 456 bank miles of severe streambank erosion

with an estimated $38,000 worth of damage annually. The greatest problem in this ASA is the higher erosion rates occurring principally on private land.

FLOOD DAMAGE

The greatest flood damages in Subarea 0405 occur in the urban areas, although the agricultural lands are also subject to considerable damage The major problems are encroachment on the natural flood plain areas and the lack of local flood plain zoning and regulation The flooding problems of many of the urban areas are the result of constructed reaches of the rivers, inadequate channel capacity, encroachment on the natural flood plain, or a combination of these causes About one-half of the urban average annual damages in Subarea 0405 occur in the Grand River basin In Subarea 0406 there are no specific problems related to the flooding, but urban areas would profit most from any effective prevention.

WILDLIFE MANAGEMENT

There does not appear to be enough land and wildlife habitat to safisy the projected needs in Subarea 0405 The resource base is shrinking as wildlife habitat land is converted to other uses Some farming practices leave little food and cover on the land Drainage, stream modification, and urban encroachment have also contributed to the reduction of wildlife habitat. An acute problem in this area is the need for preservation or protection of the remaining wetlands in the area A large portion of the inland wetland areas still remaining in the Great Lakes Basin is found in Subarea 0405

The loss of wildlife habitat to urban and resort development is a significant problem in Subarea 0406. There are other problems, some related to the use of pesticides, which have proved to be persistent and are taking their toll of many rare and endangered species as well as the more common species. Habitat loss is also affecting certain species The use of off-the-road vehicles and snowmobiles is creating wildlife mangement problems. However, because of the relatively sparse population, management practices will permit enhancement of this resource to a greater extent than in many parts of the Great Lakes Basin.

AESTHETIC AND CULTURAL RESOURCES

The major problem in Subarea 0405 is the need to preserve outstanding values Environmental buffer zones immediately adjacent to the edge of the expanding urban centers are in need of study and planning attention to insure proper use of their inherent significant resource features Environmental corridors merit consideration in this area At the present time, institutional arrangements of funding are not available to meet these objectives

In Subarea 0406, the establishment of corridors and buffer zones around and between population centers and along the shoreline and streams should be considered. Natural or cultural features should be identified at an early date and proper steps taken for their preservation

NON-VOLUMETRIC REQUIREMENTS[1]

REGION: Great Lakes (04)	ASA No . 02	AREA (in acres x 1000) 11,171 2
STATES. MI, WI	COUNTIES·	Michigan(4), Wisconsin(20)

Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]--Base Year (1970) to. 1980	2000
W.O. Outdoor Recreation[3]	1000 rec. days	8,763	1,903(2,464)	5,801(7,977)
Sport Fisning[3]	1000 angl days	11,010	2,401(3,107)	4,435(6,743)
Recreational Boating[3]	1000 boat days	4,440	490(750)	832(1,620)
	1000 acres W.S.[4]	950	951	951
Wildlife Management[3]	1000 acres		0	495
	1000 user days	5,169	369(660)	429(1,265)

Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year·[5] 1970	1980	2000
Agr. Land--Treatment	1000 acres	2,225	2,225	2,225
Forestland--Treatment	1000 acres	3,046	3,046	3,046
Shoreland Erosion[6]	miles	138	138	138
Streambank Erosion	miles	1,358	1,358	1,358
	$1000 AAD[8]	196	196	196

Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year [7] 1975	1985	2000
Flood Plains --Urban	$1000 AAD[8]	2 298	2 108	2 139
--Rural	$1000 AAD[8]	1,845	1,817	1,894
Cropland Drainage	1000 acres	---	0	0

1. From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
2. Additional resource requirements beyond 1970 requirements
3. For the Assessment, projections were derived by adjusting Framework Study projections to reflect a Series E growth level Framework Study projections, using Series C population growth, are in parentheses
4. Opportunities
5. All figures are from the Framework Study
6. The Corps of Engineers is currently conducting a shoreline damage survey for the recent period of high Great Lakes water levels (1972-1974)
7. Unless otherwise noted, all projections were developed for the 1975 National Water Assessment
8. Average Annual Damages

NON-VOLUMETRIC REQUIREMENTS[1]

REGION Great Lakes (04)	ASA No 03	AREA (in acres x 1000) 5,315 8		
STATES. IL, IN, WI	COUNTIES Illinois(6), Indiana(4), Wisconsin(7)			
Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]—Base Year (1970) to 1980	Needs[2]—Base Year (1970) to 2000
W O. Outdoor Recreation[3]	1000 rec. days	17,820	30,088(32,610)	47,212(56,930)
Sport Fishing[3]	1000 angl days	2,654	2,334(2,596)	3,306(4,196)
Recreational Boating[3]	1000 boat days 1000 acres W S [4]	1,280 470	301(384) 470	383(632) 470
Wildlife Management[3]	1000 acres 1000 user days	7,681	1,384 4,380(5,015)	2,730 5,533(7,508)
Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year [5]		
		1970	1980	2000
Agr Land—Treatment	1000 acres	2,170	2,170	2,170
Forestland—Treatment	1000 acres	212	212	212
Shoreland Erosion[6]	miles	130	130	130
Streambank Erosion	miles $1000 AAD[8]	91 32	91 32	91 32
Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year [7]		
		1975	1985	2000
Flood Plains —Urban	$1000 AAL[8]	7 736	6.969	6 141
—Rural	$1000 AAD[8]	359	355	373
Cropland Drainage	1000 acres	---	0	0

1 From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
2 Additional resource requirements beyond 1970 requirements
3 For the Assessment, projections were derived by adjusting Framework Study projections to reflect a Series E growth level Framework Study projections, using Series C population growth, are in parentheses
4 Opportunities
5 All figures are from the Framework Study
6 The Corps of Engineers is currently conducting a shoreline damage survey for the recent period of high Great Lakes water levels (1972-1974)
7 Unless otherwise noted, all projections were developed for the 1975 National Water Assessment
8 Average Annual Damages

NON-VOLUMETRIC REQUIREMENTS[1]

REGION: Great Lakes (04)	ASA No.: 04	AREA (in acres x 1000)· 16,796 1		
STATES.IN, MI	COUNTIES· Indiana (6), Michigan (39)			
Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]--Base Year (1970) to 1980	Needs[2]--Base Year (1970) to 2000
W.O. Outdoor Recreation[3]	1000 rec. days	15,708	12,539(14,026)	23,437(29,286)
Sport Fishing[3]	1000 angl days	14,078	3,898(4,844)	6,517(9,594)
Recreational Boating[3]	1000 boat days 1000 acres W S.[4]	7,059	1,739(2,202) 1,203	2,405(3,819) 1,203
Wildlife Management[3]	1000 acres 1000 user days	--- 10,898	325 798(1,414)	1,302 473(2,172)
Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year[5]		
		1970	1980	2000
Agr. Land--Treatment	1000 acres	4,558	4,558	4,558
Forestland--Treatment	1000 acres	5,793	5,790	5,790
Shoreland Erosion[6]	miles	320	320	320
Streambank Erosion	miles $1000 AAD[8]	2,341 182	2,346 182	2,346 182
Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year[7]		
		1975	1985	2000
Flood Plains				
--Urban	$1000 AAD[8]	3,370	4,460	5,980
--Rural	$1000 AAD[8]	2,294	2,195	2,378
Cropland Drainage	1000 acres	---	68	160

1 From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
2 Additional resource requirements beyond 1970 requirements
3 For the Assessment, projections were derived by adjusting Framework Study projections to reflect a Series E growth level Framework Study projections, using Series C population growth, are in parentheses
4 Opportunities
5 All figures are from the Framework Study
6 The Corps of Engineers is currently conducting a shoreline damage survey for the recent period of high Great Lakes water levels (1972-1974)
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8 Average Annual Damages

LAKE HURON REGION - ASA 05

WATER QUALITY

Lake Huron is second only to Lake Superior in the high quality of its water. The use of the lake for a public water supply for the Detroit metropolitan area and other places will encourage maintenance of high quality The Saginaw River discharges considerable quantities of nutrients from industrial, municipal, and agricultural sources into the Saginaw Bay, and excessive algal blooms in warm weather have occurred. The quality of the water of the Saginaw Bay reflects the materials received from the Saginaw River and the smaller contributions from other tributaries. While the existing water quality of the bay as a whole is adequate to support all designated uses with moderate exceptions, the waters of the inner bay are substandard with respect to nutrients, and water quality along the western shore of the Saginaw Bay north of Bay City is substandard because of the high coliform levels that occur at a limited number of beaches.

Water quality in a number of nearshore areas within the harbors and at the mouth of tributary streams is lower than that of Lake Huron proper. These areas include the Straits of Mackinac, Cheboygan Harbor, Rogers City Harbor, Thunder Bay, Harrisville Harbor, Oscoda Harbor, Harbor Beach, and Port Sanilac In 1974, the areas in Lake Huron not meeting the IJC Water Quality Objectives were Saginaw Bay and the St. Mary's River. These objectives were established according to the provisions of the U.S.-Canada Water Quality Agreement.

Water quality problems, although localized, are present throughout the Lake Huron basin. A number of stream reaches in Subarea 0407 are subject to pollution resulting from discharges of effluent from primary treatment plants, industrial waste discharge, and discharge of untreated and partially treated sewage Such conditions are found in portions of the Au Sable, Thunder Bay, and Cheboygan Rivers.

In recent years, severe water quality problems in Subarea 0408 have been experienced in the Saginaw River over virtually its entire length, in the Flint River in the vicinity of the City of Flint, and in the lower portion of the Cass River Poor water quality results from storm water overflows, tributary waste loads, industrial discharges, and untreated or partially treated sewage discharge from outlying areas in the subarea _Water quality limited segments in Subarea 0408 are the Flint River from Flint to the Genesee-Saginaw County line, the Shiawassee River from Linden to the Genesee-Shiawassee County line, the Shiawassee River from Owosso to ten miles downstream, and the Tittabawassee River from Midland to the Midland-Bay County line.

COMMERCIAL AND SPORT FISHERY

The management objective of the State of Michigan is to enhance the sport fishery in Lake Huron and to utilize the commercial fishery in conjunction with the sport fishery as a management tool. In general, the sport fishery is far more valuable in terms of revenues produced and affects far more people than would a rejuvenated commercial fishery. However, by proper management and coordination of the two, both can be made more effective in meeting needs for pleasure and food

Problems of fish habitat in Subarea 0407 are related to the rapid development of recreational properties which has caused considerable damage to both lakes and streams Problems which need to be addressed include dredging and filling which reduces the available spawning areas in some of the inland lakes; septic tank runoff from heavy cottage development which speeds up the process of eutrophication in

some of the inland lakes, intense streamside cottage development which destroys some of the aesthetic and cultural attractions, and the construction of low head dams on trout feeder streams which elevates the temperatures beyond the limits where trout will survive.

Water pollution from industrial, municipal, and agricultural development in Subarea 0408 has diminished the fishing quality in many of the major rivers and impoundments, particularly around Flint, Saginaw, Bay City, and Midland Additional problems are serious erosion and siltation from both urban construction and agriculture In addition, fish management for valuable sport species and the removal of rough fish species is a problem There is need for fish production through fish hatcheries, fish population control, habitat improvement and protection, and improved access.

OUTDOOR RECREATION

The Lake Huron region has many of the same problems which occur throughout the Great Lakes area with respect to outdoor recreation, but the region itself is so diverse in many respects that problems range widely in nature In the northern part where there are considerable forest, lake, and river resources, the economic situation is depressed, and there has not been adequate development of the resources by the private sector for public use Recreational development is likely to increase at a rapid rate because of the influx of persons from the more crowded southern areas in the Lake Huron basin and the adjacent Lake Erie basin (Detroit and environs particularly) who will make use of the facilities of the northern part of the Lake Huron region

The southern part of the Lake Huron region, on the other hand, has a very small area of land and water devoted to recreation The land available for recreation in Subarea 0408 is rather limited The greatest current need is for the development of facilities usually associated with the urban areas. There is a shortage of trail developments and the need for camping acreage is estimated to increase. Because there is relatively little public land available for more intensive development, the total land acreage that must be acquired and developed is relatively large

RECREATIONAL BOATING

While there are about 23 boat harbors on the Lake Huron shore, the use of Lake Huron for recreational boating is limited by the lack of suitable mooring places and space If additional facilities were developed, together with a suitable communication system for informing boaters of weather conditions, the Lake could be utilized for recreational boating much more extensively than it now is In order to utilize the existing inland water base at the projected usage by the year 2000, it will be necessary to almost double the number of access sites. Additional harbors would greatly enhance the safety of this area for Great Lakes boaters and provide additional sheltered mooring waters at which to base a significant portion of the projected new recreational craft ownership. Boating is a major recreational activity in Subarea 0408 A positive resource management program is essential to protect and assure the existing water resource base and to meet the projected needs The features of such a program would include the regulation and management of boating activities to achieve greater utilization of the water resources, resource management and protection, and facility development to increase opportunities to use the resource base.

COMMERCIAL NAVIGATION

The amount of traffic handled at commercial ports on Lake Huron is not a significant part of the total commercial traffic on the Great Lakes, but the traffic carried on Lake Huron itself is significant. The season extension will have beneficial effects on the ports on Lake Huron, even though specific work at these ports is not a part of the program. Commercial navigation will be influenced by the total treatment of this resource throughout the Great Lakes Basin Much of the area population is supported by industries producing or utilizing large quantities of bulk commodities, and the economy of this area is highly dependent upon the efficient, low cost transportation systems.

LAND TREATMENT AND DRAINAGE

Problems in land use, particularly in the shoreline areas, are increasing because of the influx of seasonal residents, speculative land developers, and mining activities This situation points to the need for a land use policy, implemented with controls such as zoning Approximately 870,000 acres of agricultural land in the Lake Huron drainage basin have poor drainage Based on the historic rate of wet soil conversion to cropland (See P 113, last paragraph), no additional drainage is projected for this ASA. Drainage limitations not only affect agricultural production potential, but also may place limitations on urban growth In the Saginaw-Bay City SMSA, which has a total nonurban base of about 711,800 acres, dry soils without a wetness problem are scarce, estimated at only about 40,000 acres

One of the greatest existing forest land problems is how to secure good management on private land. Another management problem that must be considered is how to secure good management, protection, and establishment of trees and shrubs in areas surrounding urban areas. Maintenance of forest cover is needed for watershed protection, continued timber production, recreation, fish and wildlife habitat, aesthetics, and a combination of these values

SHORELAND EROSION AND MANAGEMENT

Although the Lake Huron shorelines are protected by westerly winds and are relatively free of areas of critical erosion, the amounts of erosion have increased markedly due to high water and severe winds in some areas over the last several years. In 1973 there were estimated to be over 100 miles of high risk erosion shoreline. Flooding along Saginaw Bay is often severe.

STREAMBANK EROSION

Streambank erosion and resulting sedimentation are moderately severe in the Lake Huron basin with over 1,700 bank miles subject to some erosion Streambank erosion along rivers with less than 400 square miles of drainage area amounts to about 612 miles with severe erosion and 950 miles with moderate erosion. Streambank erosion along rivers and streams draining more than 400 square miles amounts to about 147 miles of streambank that are subject to erosion, without about one-third of that mileage subject to severe erosion The major problem in alleviating streambank erosion is that the eroded areas are scattered and expensive to treat There is also a need for further study of methods and effectiveness of treatment

FLOOD DAMAGES

Even though many of the rivers and the drainage areas in the Lake Huron basin are small, there are flood problems. Flood overflows resulting from ice jams and floods created by severe rainstorms have caused damages to both urban and rural areas. Flooding problems in Subarea 0407 are relatively minor and generally local in nature. Areas affected have been farm lands, power facilities, and secondary roads and their drainage structures. Storm and prolonged rain have caused soil losses from cultivated fields. In Subarea 0408, the greatest flood damages are projected to occur in the rural areas until the latter part of the study period. The flood problems in the urban areas are the results of constricted reaches of river, inadequate channel capacity, encroachment on the natural flood plain, or a combination of these causes.

WILDLIFE MANAGEMENT

Wildlife habitat in the Lake Huron basin is diverse. It includes the northern forests, active and fallow cropland, and some of the most valuable waterfowl marsh in the State of Michigan. Urban areas comprise a significant portion of the lower portion of the basin, and their associated problems have seriously degraded some of the wildlife habitat. Changes in forest succession are also occurring to some extent. The loss and degradation of wetland habitat around Saginaw Bay is one of the most critical wildlife resource problems. The construction of a small boat channel, docks, and other marine facilities in the marsh area have adversely affected wildlife resources Shrinking hunter access to wildlife land is a problem because wildlife habitat is expected to decrease while gross hunter demand is expected to increase.

AESTHETIC AND CULTURAL RESOURCES

Environmental systems of the Lake Huron basin in most critical need of planning attention are linkage corridors, resource clusters, buffer zones, and shore zones. The projected increase in urban development through the year 2000 makes prompt planning attention urgent to both subareas in this basin but particularly to Subarea 0408. The Lake Huron basin contains a wealth of diverse and often unique aesthetic and cultural resources The major problem is the need to preserve the outstanding values of these resources, which include beaches and wetlands, unique glacial formations, wildlife areas, and sites and objects pertaining to early Indian cultures and to exploration Additional legislation may be needed to expedite a program of acquisition and management. The private sector should be encouraged to participate in the program for preservation and protection of these unique and significant areas. A number of these areas need to be identified at an early date and proper steps taken for their preservation.

NON-VOLUMETRIC REQUIREMENTS[1]

REGION: Great Lakes (04)	ASA No. 05	AREA (in acres x 1000) 8,628 4
STATES MI	COUNTIES: Michigan(22)	

Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]—Base Year (1970) to 1980	Needs[2]—Base Year (1970) to 2000
W O. Outdoor Recreation[3]	1000 rec. days	5,310	6,052(6,650)	10,185(12,500)
Sport Fishing[3]	1000 angl. days	6,140	2,600(3,060)	4,239(5,790)
Recreational Boating[3]	1000 boat days	3,800	798(1,040)	1,081(1,810)
	1000 acres W.S [4]	854	854	854
Wildlife Management[3]	1000 acres		239	771
	1000 user days	6,800	444(825)	604(1,710)

Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year: [5] 1970	1980	2000
Agr. Land—Treatment	1000 acres	2,050	2,050	2,050
Forestland—Treatment	1000 acres	2,810	2,810	2,810
Shoreland Erosion[6]	miles	162	162	162
Streambank Erosion	miles	1,710	1,710	1,710
	$1000 AAD[8]	142	142	142

Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year [7] 1975	1985	2000
Flood Plains				
—Urban	$1000 AAD[8]	676	837	1,039
—Rural	$1000 AAD[8]	1,167	1,163	1,196
Cropland Drainage	1000 acres	---	0	0

1 From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
2 Additional resource requirements beyond 1970 requirements
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8 Average Annual Damages

LAKE ERIE

WATER QUALITY

The physical geography of the Lake Erie basin and the very high degree of economic development have created some situations within Lake Erie that are more aggravated than in the other Lakes Lake Erie is the smallest of the Great Lakes in volume, with less assimilative capacity The Lake Erie region has the second largest concentration of population of any of the Lakes, resulting in large inputs of pollutants The Maumee River brings in large amounts of sediment eroded from the agricultural and other land in the Maumee basin. Lake Erie is the most polluted of the Lakes, to the extent that it has almost become a symbol of lake pollution and high eutrophication Although Lake Erie has the most rapid turnover of water of any of the Great Lakes, this exchange of water through inflow and outflow does not occur uniformly throughout the Lake and the places where flow and exchange do not take place have become critically polluted

In 1974, the following areas in Lake Erie did not meet one or more of the International Joint Commission Water Quality Objectives established according to the 1972 U.S -Canada Water Quality Agreement Cleveland area, Toledo area, Sandusky River, Huron River (Ohio), Vermilion River, Rocky River, Ashtabula River, Conneaut Creek, Chagrin River, Portage River, Black River, Detroit River, St Clair River, Western Lake Erie, Grand River (Ohio), Fredonia area (New York), and the Westfield area (New York) Except for connecting channels, problem areas identified with rivers refer to areas in the boundary waters at the mouth of the river

COMMERCIAL AND SPORT FISHERIES

The commercial fishery of Lake Erie has undergone major changes in the past century and a half. The changes have been caused by changing demand for fish species, changing techniques for harvesting the various species, and changes in the numbers of various species. Lake Erie still supports a considerable number of fish and a large harvest could be taken, but the species available are not those which are in demand, so a large commercial fishery is not profitable

Sport fishing has also been an important feature of Lake Erie for many years, particularly in the western basin The most desired species are usually not the most prevalent, and a larger sport fishery could be supported if fishermen were willing to take some of the more abundant, less desirable species.

With four States of the United States and the Province of Ontario in Canada each managing the fishing in its waters in a somewhat different fashion, there has been very little consistency in the regulation of either commercial fishing or sport fishing, except through the limited coordination activities of the Great Lakes Fishery Commission In general, the sport fishery has experienced fewer limitations and less management than the commercial fishery. The present policy of the States points to managing in the interest of the sport fishery in the lake. Physical facilities, stocking, access, and other devices will be used to develop the sport fishery and the commercial fishery will be managed to compliment it.

Measures being taken include such physical developments as may be warranted, stocking, control of the fishery to maintain a proper balance between predators and prey fish, and the necessary studies, research sampling, and similar programs that will lead to a better identification and knowledge of the fishery characteristics of the lake and the way in which the fishery can be managed

OUTDOOR RECREATION

The numbers of people living in the basin and the industries which have developed have contributed to the pollution of Lake Erie to such an extent that many of the beaches which should be available for recreation are closed There is adequate water on the lake for recreational boating but, because of limited access, infrequent harbors-of-refuge, and inadequate communications, not all of the water surface can be utilized Some of these matters can be taken care of by prudent investment. The western part of the Lake Erie shore consists largely of wetland habitat, some of which is threatened by filling operations for industrial purposes.

RECREATIONAL BOATING

If recreational boating needs are to be met in the Lake Erie basin, much of the increased use will have to be on Lake Erie itself. This will require a program of construction of small boat harbors, both as harbors-of-refuge and as locations for marinas and berthing facilities Also needed will be access points on the lake and a system of weather forecasting with notification of adverse weather conditions to the users of small boats.

COMMERCIAL NAVIGATION

Most of the problems associated with the structural and operational changes in the Great Lakes-St. Lawrence navigation system and the Lake Erie part of that system are being addressed in ongoing studies. Completion of ongoing studies, development of new technology, and strong local port promotion policies could significantly affect the total traffic handled at Lake Erie ports.

WESTERN LAKE ERIE REGION - ASA 06

WATER QUALITY

Existing water quality problems are severe in Subarea 0409, particularly in the Clinton River, Rouge River, and Huron River basins. Another area of severe water degradation is the Detroit River where it enters Lake Erie. Poor water quality results from nutrient discharges, agricultural wastes, some raw sewage overflow discharge from combined sewers, and primary and secondary treatment plant effluent in streams whose flow is inadequate to assimilate such wastes Corrective programs are underway to upgrade water quality throughout the subarea. Water quality limited segments in Subarea 0409 are the Clinton River from Pontiac to the mouth and the Red Run basin, the Huron River from Dexter through Ford Lake, and the Saline River to ten miles downstream

This highly urbanized subarea is in the process of planning regional interceptors and waste treatment plants. Disagreements among local governments, regional planning agencies, and the State of Michigan with respect to whether certain municipalities should be forced to participate in regional systems has delayed construction

Throughout the entire subarea there is a need to implement programs for the reduction of agricultural wastes, nutrients, sediments, insecticides, and herbicides.

Water quality problems in Subarea 0410 are caused by inadequately treated municipal wastewaters, industrial effluents, and urban and rural runoff. Extensive agricultural activities and erosion of fine clay soils contribute sediment, nutrients, and other agriculturally related chemicals to the subarea's streams and Lake Erie The low assimilative capacity of many of the streams requires advance treatment of wastewaters Some of the major problems associated with waste discharges are the difficulty of financing treatment plants, the need to reduce or eliminate combined sewage overflows, and the need to reduce sediment and nutrient loads

Water quality segments in Subarea 0410 are: in Michigan, the South Branch of the River Raisin from Adrian to the confluence with the main branch; in Indiana, Cedar Creek, and the Maumee River (main stem), and in Ohio, the Maumee River (main stem from Indiana state line to Defiance and northern tributaries), Lake Erie (from mouth of Maumee to western Cuyahoga County line, including minor tributaries, Portage River (main stem and tributaries), Vermilion River (whole basin), Sandusky River (main stem and tributaries), and the Huron River (whole basin).

SPORT FISHERY

The projected sport fishery needs are based on a transfer to other portions of the Great Lakes Basin of considerable demand originating in ASA 06 both now and in the future. One of the most significant problems in Subarea 0409 affecting sport fishing has resulted from filling of shore marshes to create building sites This practice has significantly reduced the available spawning areas, particularly for northern pike Poor water quality due to industrial and municipal pollution has degraded many of the rivers and impoundments to the point that rough fish such as carp are all that remain

There are many problems associated with providing sport fishing opportunities in Subarea 0410 Impoundments in natural drainage ways are eutrophic primarily because of intensive agricultural land management activities and, secondarily, because of human wastes. Water quality problems have degraded some streams, such as the Ottawa River between Lima and its mouth, sufficiently to preclude significant fish populations. Channel modifications, although producing some flood control and drainage benefits, have frequently not been maintained in such a way as to permit natural stream conditions that provide a desirable stream fishery habitat.

OUTDOOR RECREATION

Meeting the needs for outdoor recreation in Subarea 0409 is a problem because there are considerable pressures for other land uses with greater economic returns than recreational use. The availability at the present time of recreation land per thousand people in this highly urbanized area is much lower than accepted standards In addition to pressures for other land uses, some of the more serious problems associated with satisfying recreational needs in this subarea are degraded water quality, lack of adequate funding, development in the flood plains which precludes recreational use, and competing uses for shorelines

Conflicting land use pressures between agricultural, aesthetic, and cultural, wildlife, and recreation uses are a major concern in Subarea 0410. Additional problems associated with satisfying the recreational needs are that much of the water is of such low quality throughout the subarea that pleasant recreational opportunities are not possible, many of the streams in this area have low flows in the recreation season, and land acquisition for recreation purposes in urban areas is excessively expensive because of the competing land uses Poor water quality is a definite prohibition on recreational opportunities in Lake Erie near Toledo, the Ottawa River below Lima, the Blanchard River below Findlay, and the Maumee River below Fort Wayne.

RECREATIONAL BOATING

One of the main problems in Subarea 0409 is that existing inland waters are overused at the present time for recreational boating. An additional problem is that many of the remaining reservoir sites that have boating opportunities are being bought up and the land used for other purposes. The lack of stream improvements, lack of maintenance, and periodic low flows limit the amount of canoeing and small boat opportunities on inland streams.

The main recreational boating problem in Subarea 0410 is that inland waters are being used at about three times the desirable capacity while Great Lakes waters are being used at about one-third of desirable capacity The use of the Great Lakes waters is limited by the number of suitable mooring places and the space between harbors. Facilities should be provided for disposing of vessel wastes.

COMMERCIAL NAVIGATION

The problems related to port facilities will probably be those associated with changing the types of commodities handled Other commercial navigation problems that apply to ports in ASA 06 are the shortage of municipal funds to put into port facilities and the fact that overland carriers do not afford lake ports equitable land accesss in the form of nondiscriminatory rates and equal services.

LAND TREATMENT AND DRAINAGE

There are an estimated 5,125,500 acres in ASA 06 which would benefit from agricultural land treatment conservation measures to reduce soil losses and to conserve plant cover. The greatest problem associated with the conservation of agricultural lands is the increasing pressure to convert to other uses In many cases, these other land uses reduce the amount of cover on the land and increase the rate of erosion and the amount of sediment There are an estimated 2,954,000 acres of agricultural land in ASA 06 with a wetness problem. Most of the drainage problems occur in Subarea 0410. Production on this land within its present use is reduced or limited by excess water in the soil profile There is an acute shortage of well-drained soil for urban development around Toledo, Ohio, Fort Wayne, Indiana, and Lima, Ohio

Some of the major problems in ASA 06 are how to secure good management for private forest lands and how to protect and establish trees and shrubs in areas surrounding urban and built-up areas. The declining average of forest land as it gives way to agricultural uses, highways, power lines, reservoirs, and urban recreational and industrial development is another critical issue It is difficult to satisfy demands for these goods and services without a decline in forest land The land use conflict is particularly acute in buffer zones around urban areas and in the corridors linking urban areas.

SHORELAND EROSION AND MANAGEMENT

There are no reaches of shoreline in Subarea 0409 subject to critical or noncritical shoreline erosion, although there are some flooding problems The major problem related to shore use is that a very small amount of the shoreline is available for public use. Transportation facilities, power plants, and other uses continue to decrease shoreline availability. There is considerable need and interest in emphasizing wildlife uses of the shoreline and protecting it for the continuation of those uses, as well as providing for more public use

About one-third of the Lake Erie shoreline in Subarea 0410 is subject to noncritical erosion, and much is subject to inundation during severe easterly storms. There is a considerable need in this area for marsh and wetland management. Because of the expanding metropolitan areas, there is a need for more publicly owned shoreline

STREAMBANK EROSION

Streambank erosion results in increased sedimentation in streams and the resultant degraded water quality prevents other uses of the water. A major problem in alleviating streambank erosion is that high erosion rates occur largely on private land, and the owners may not have the finances or the desire to implement streambank erosion projects. There are an estimated 1,775 bank miles in ASA 06 with erosion problems, average annual damages are approximately $179,000

FLOOD DAMAGES

The greatest flood damages in ASA 06 occur in the urban areas. High lake levels and easterly winds cause flooding along the shorelands of Lake St Clair and Lake Erie. Ice jams are a major cause of stream overflows in the Port Huron area In the Clinton River basin, the capacity of the Red Run Drain has been exceeded, and this has caused flooding problems in the basin. Structural improvements have been authorized, but have not yet been implemented Problems in the Route River basin result from inadequate sewer and drainage ditch capacity and from low basements

The flood problems of the urban areas in the Maumee River basin are the result of constricted reaches of the rivers, inadequate channel capacity, encroachment on the natural flood plain, or combinations of these causes. The principal damage from floods in the Portage River basin results from the loss of crops during the growing season. Encroachment on the flood plain and constricted channels are major problems in the Sandusky River basin. Floods on the Vermilion River are often accompanied by ice jams so that resulting flood stages are higher than they would be from river discharge alone.

WILDLIFE MANAGEMENT

One of the greatest problems in Subarea 0409 is the need to set aside and protect areas having considerable wildlife value as feeding grounds or appropriate habitat. In particular, marshes in the lower Detroit River need to be protected and preserved.

There does not appear to be an adequate supply of land and wildlife habitat in order to satisfy projected needs in Subarea 0410. Wildlife habitat land is being reallocated to other uses and some farming activities leave little remaining wildlife habitat. Due primarily to the lack of funds for wildlife enhancement, channel modification in this area has reduced wildlife habitat. An additional acute problem in

this subarea is the need for preservation or protection of the remaining wetlands adjacent to the Lake Erie shoreline.

AESTHETIC AND CULTURAL RESOURCES

With respect to aesthetic and cultural values in ASA 06, the major problems are industrial and residential use of shoreline which competes with preserving aesthetic values, the inadequacy of funds for land acquisition, and the need to preserve outstanding values.

EASTERN LAKE ERIE REGION - ASA 07

WATER QUALITY

Among the major water quality problems in Subarea 0411 are high bacterial counts, which prevent body contact recreation in most principal streams; low dissolved oxygen levels, which hinder fish production; and the construction and operation of treatment facilities, made difficult by complex problems associated with financing, manpower, and legislation There is a need for regional authorities and master planning in the consolidation and integration of collection systems and treatment facilities. Enforcement of water quality standards and the checking of industrial waste treatment discharges is very expensive from a government point of view There is a need to reduce agricultural wastes, including nutrients, sediments, insecticides, and herbicides. There is a need for an expanded area-wide surveillance system and a need to reduce dissolved solids

At the present time, the headwaters of the Cuyahoga River above Akron, Ohio, generally exhibit good water quality and serve as a source of public water supply. However, water quality degradation is expected due to the potential urban development in the general Cleveland-Akron area. There is, therefore, an immediate need to assure that this urban development does not result in such degradation. The river below Akron is seriously polluted, with the lower reach of navigation channels exhibiting gross amounts of oils, solids, and oxygen-consuming materials stemming from both municipal and industrial discharges.

Stream segments and portions of Lake Erie that are classified as water quality limited in Subarea 0411 are the Cuyahoga (Lake Rockwell dam to the mouth, and tributaries; also, upstream of Lake Rockwell), Lake Erie (western Cuyahoga County line to the Grand River, including minor tributaries, also, from the mouth of the Grand River to the Ohio-Pennsylvania State line), the Rocky River (whole basin), the Chagrin River (whole basin); the Grand River (whole basin); and the Ashtabula River (whole basin)

The increase in municipal wastewater discharges to be treated in Subarea 0412 reflects in part the increasing reliance of industry on municipal treatment plants. The disposal of untreated wastes directly into the Niagara River at several points severely degrades water quality. Combined sanitary and storm sewer systems are a problem in Subarea 0412, with untreated storm water overflows contributing to poor water quality in the Niagara River and Lake Erie. Drilling for oil and natural gas in Lake Erie is presently restricted in New York in response to concern over exploration practices which could degrade water quality. Water quality limited segments in Subarea 0412 are. the Niagara River main stem, the South Branch of Cattaraugus Creek, Cattaraugus Creek, and Lake Erie.

SPORT FISHERY

One of the major limitations affecting fish production and distribution in Subarea 0411 is that all ponded waters in this area are to some degree eutrophic Accelerating rates of eutrophication are occurring as a result of intensive agricultural use. Sedimentation has been responsible for altering habitat in older impoundments. Water level fluctuation, thermal stratification, and low dissolved oxygen conditions are other problems in impoundments in northeastern Ohio. Poor water quality is also a major deterrent to stream fishing opportunities In headwater areas, limiting factors on fishing productivity such as siltation are related to agricultural and flood control practices. Impoundments on tributaries in the headwaters of the Cuyahoga River are thought to have eliminated the upstream and lateral nursery areas that supply the sport fishery along the main stem of the river. Although the role that pesticides play in limiting fish production is not entirely clear, there is concern that this is also a problem.

OUTDOOR RECREATION

To meet estimated recreation-day requirements in ASA 07, the present availability must be markedly increased by the year 2000. This emphasizes the need for land use planning and the very immediate need for identification, preservation, and conservation of recreational opportunities throughout the entire ASA. Two other problems are specifically relevant for the area. There is a considerable need for additional water for boaters and water skiers. The demand for such facilities will not be adequately met in the near future. On the other hand, large amounts of needs for swimming can be met on relatively smaller areas of water surface. Lake Erie has vast expanses of water surface that are potentially available to meet the need for power boating However, at the present time, activities are restricted to a significant degree by limited launching and docking facilities, by rough water, and by limited public ownership of lake frontage.

RECREATIONAL BOATING

One of the major problems in Subarea 0411 is that there are few harbors of refuge on the Great Lakes Although commercial harbors are used by recreational craft, no improvements have been made specifically for such craft. This area has only a few streams suitable for canoeing The lack of stream maintenance and periodic low flows limit the amount of canoeing and small boat opportunuties on these streams The lower reaches of several streams have been improved for commercial navigation but are little used by recreational craft due to unattractive industrial surroundings and the presence of large ships There is need for a continuing program of improving small boat harbors on Lake Erie. This is essential to the expansion of recreational boating on these waters. Future opportunities for recreational boating in this area must be largely oriented toward the Great Lakes because inland waters now are utilized to capacity.

The needs for boating water to provide adequate additional boat days in Subarea 0412 are divided between inland water and the Great Lakes, with the latter significantly greater in each time period. Problems associated with using the existing water surface are access to inland lakes and streams, degraded water quality on some of the streams, which makes boating and canoeing unattractive, and the need for marinas and harbors of refuge on Lake Erie.

COMMERCIAL NAVIGATION

Ports in Subarea 0411 are projected to handle considerably more receipts of iron ore in the future than they have in recent years. Competitive iron ore from the east and possible movement of coal by pipeline could present serious problems for commercial navigation in this area in the future There are no problems peculiar to Subarea 0412. The dredging of harbors is necessary as a continued maintenance program. Enlargement will be necessary if larger ships are to be accommodated.

LAND TREATMENT AND DRAINAGE

The greatest problem associated with the conservation measures on agricultural land is the increasing pressure to convert these lands to other uses. It is estimated that practices could be applied to reduce soil losses and conserve plant cover on about 700,100 acres of agricultural land in Subarea 0411 and 552,000 acres in Subarea 0412. These measures could be expected to reduce erosion and flooding and the consequent sedimentation, and to increase the production of food and fiber

Drainage measures can have both beneficial and adverse effects depending on the possible alternative uses of the land. Urban development may alter or cut off natural surface or subsurface drainage patterns. A large portion of Subarea 0411 has severe drainage limitations, with the exception of the area around Akron, the upstream Cuyahoga area, and a portion of the Grand River valley. This means that it would be very difficult to provide adequate drainage in most of this subarea, but does not necessarily mean that this land cannot be used for cropland. About 341,000 acres have a drainage problem in Subarea 0412.

Maintenance of forest cover is needed for watershed protection and for continuing multiple resource uses. The major problem associated with forest land treatment is that of maintaining the forest land in the face of pressures for change Reduction of sediment in streams and increased opportunity for recreation and aesthetic and cultural uses would be the major benefit from a program of forest land treatment in ASA 07. In addition, forest land treatment would help maintain high quality water in those upstream reservoirs that are proposed for water supply.

SHORELAND EROSION AND MANAGEMENT

In Subarea 0411 there are an estimated 14 3 miles subject to critical erosion along the shoreline of Lake Erie and an additional 9.9 miles subject to noncritical erosion, based on 1970 evaluations. Severe damage from shoreline erosion occurred during the high lake levels of the early 1970s. In several highly developed areas, erosion has become critical, and many homes will be lost unless protected immediately. There are 6 miles of Lake Erie shoreline in Subarea 0412 subject to critical erosion in Pennsylvania and 36 miles in that state subject to noncritical erosion. There are also 10.6 miles in New York subject to noncritical erosion

STREAMBANK EROSION

There are 719 streambank miles in ASA 07 subject to moderate or severe streambank erosion. In the streams for which the drainage area is less than 400 square miles, there are about 567 bank miles subject to moderate damage and 73 bank miles subject to severe damage The total average annual damages for these

reaches is $38,200 For streams with drainage of more than 400 square miles, there are 35 bank miles subject to severe damages. The damages for these reaches are estimated to total $361,500 annually The total annual damages are estimated at $399,700

FLOOD DAMAGES

In ASA 07, the greatest flood damages occur in urban areas. Encroachment on the flood plain and the lack of flood plain regulations and zoning are major problems resulting in the high damage levels As areas now rural become urbanized, the losses from flooding will increase sharply unless measures are taken to prevent development in the flood plain

WILDLIFE MANAGEMENT

Major wildlife management problems in ASA 07 are those of land use and maintaining adequate acreages of wildlife habitat The small size of most public hunting areas in this area severely limits their ability to provide quality hunting opportunities and major game species Crowding and the resultant lowering of the quality of the outdoor experience will probably be the foremost of the foreseeable problems on public wildlife lands. The restrictions of hunting access on private land and water pollution are other problems in this ASA It is important that channel modification projects include wildlife enhancement features

AESTHETIC AND CULTURAL RESOURCES

The primary problems in preserving outstanding, unusual, and significant values in ASA 07 is one of competing land uses and lack of money available for acquisition Around each of the metropolitan areas, buffer zones are desirable to make urban life more pleasant and to give relief from the continuous build-up of homes and businesses.

NON-VOLUMETRIC REQUIREMENTS[1]

REGION Great Lakes (04)	ASA No. 06	AREA (in acres x 1000) 10,430 8		
STATES: MI, IN, OH	COUNTIES Michigan (9), Indiana (3), Ohio (20)			
Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]—Base Year (1970) to 1980	Needs[2]—Base Year (1970) to 2000
W O Outdoor Recreation[3]	1000 rec. days	14,103	23,414(25,390)	37,960(45,740)
Sport Fishing[3]	1000 angl. days	13,900	2,147(2,992)	4,199(6,903)
Recreational Boating[3]	1000 boat days	4,749	843(1,137)	1,476(2,406)
	1000 acres W S.[4]	583	583	583
Wildlife Management[3]	1000 acres	---	752	1,492
	1000 user days	9,492	3,663(4,355)	4,675(6,792)
Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year[5]		
		1970	1980	2000
Agr. Land—Treatment	1000 acres	5,126	5,126	5,126
Forestland—Treatment	1000 acres	769	769	769
Shoreland Erosion[6]	miles	28	28	28
Streambank Erosion	miles	1,775	1,775	1,775
	$1000 AAD	179	179	179
Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year[7]		
		1975	1985	2000
Flood Plains —Urban	$1000 AAD[8]	32,310	40,927	50,157
—Rural	$1000 AAD[8]	7,904	6,758	10,290
Cropland Drainage	1000 acres	---	108	104

1 From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
2 Additional resource requirements beyond 1970 requirements
3 For the Assessment, projections were derived by adjusting Framework Study projections to reflect a Series E growth level Framework Study projections, using Series C population growth, are in parentheses
4 Opportunities
5 All figures are from the Framework Study
6 The Corps of Engineers is currently conducting a shoreline damage survey for the recent period of high Great Lakes water levels (1972-1974)
7 Unless otherwise noted, all projections were developed for the 1975 National Water Assessment
8 Average Annual Damages

NON-VOLUMETRIC REQUIREMENTS[1]

REGION: Great Lakes (04)	ASA No 07	AREA (in acres x 1000) 5,445 2		
STATES. OH, PA, NY	COUNTIES: Ohio(8), Pennsylvania(1), New York(4)			
Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]--Base Year (1970) to: 1980	2000
W.O. Outdoor Recreation[3]	1000 rec. days	16,641	12,010(13,518)	21,631(27,350)
Sport Fishing[3]	1000 angl. days	13,950	1,091(1,883)	4,487(7,242)
Recreational Boating[3]	1000 boat days	1,356	297(384)	340(594)
	1000 acres W.S.[4]	656	656	656
Wildlife Management[3]	1000 acres		136	585
	1000 user days	4,414	1,804(2,131)	2,355(3,366)
Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year[5]		
		1970	1980	2000
Agr Land--Treatment	1000 acres	1,252	1,252	1,252
Forestland--Treatment	1000 acres	1,457	1,460	1,460
Shoreland Erosion[6]	miles	77	77	77
Streambank Erosion	miles	719	719	719
	$1000 AAD[8]	400	400	400
Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year[7]		
		1975	1985	2000
Flood Plains				
--Urban	$1000 AAD[8]	2,430	2,878	3,323
--Rural	$1000 AAD[8]	1,183	1,369	2,946
Cropland Drainage	1000 acres	---	0	0

1 From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
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4 Opportunities
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WATER QUALITY

Probably the most serious and perplexing problem in Lake Ontario is the yearly crop of cladophora, a form of filamentous green algae. The largest single source by far of nutrient input to Lake Ontario is the Niagara River, reflecting the fact that this Lake is downstream from four other lakes and suffers the consequences of what happens above it in the basin. Other problems peculiar to Lake Ontario include the invasion of the alewife, a trash fish which dies in enormous numbers within a short period during each summer and drifts onto the shores, adding their stench to the windrows of rotting cladophora on the beaches. In addition to the build-up in nutrient compounds, Lake Ontario waters have deteriorated in chemical quality measured by such parameters as the sulfate and chloride ions and total dissolved solids.

In 1974 the areas in Lake Ontario not meeting the IJC Water Quality Objectives were the Niagara River, Twelve Mile Creek, the Buffalo River, Tonawanda Creek, Niagara Beach, Olcott Harbor, Rochester Harbor area, Oswego Harbor area, the Black River, and the St. Lawrence River. Except for connecting channels, problem areas identified with rivers refer to areas in the boundary waters at the mouth of the river.

There are serious water quality problems in Subarea 0413 which may not readily be resolved by conventional treatment methods. An accelerating rate of eutrophication has occurred in some of the smaller interior lakes as a result of cottages ringing the lakes. Because of the rapidly rising chloride levels in area waters, the possibility for immediate reduction of salt applied during the winter to control road ice should be examined. Pesticides are extensively used in the fruit belt of the lake plain area and closer control is clearly indicated. An additional significant planning problem in this river basin group is that the Rochester embayment, which includes the Monroe County shoreline of Lake Ontario and Irondequoit Bay, has water pollution problems caused by the discharge of municipal wastes and industrial wastes High bacterial counts from the metropolitan sewage have caused the main public beaches in the embayment to be closed Water quality limited segments in Subarea 0413 are Lake Ontario (western section), Mid-Genesee (Mt. Morris to Barge Canal), and Honeoye Creek.

The overall water quality in Subarea 0414 has for some time been considered a very severe problem. Perhaps the worst areas are in the rural parts of the Wayne-Cayuga Complex and throughout the Oswego River Basin. A good many of the Finger Lakes themselves have, for the most part, water of satisfactory quality, although in many cases, either at the inlet or the outlet or at some point along the perimeter of the lake, the water is of a quality which restricts its use. Lake Onondaga and Oneida Lakes have particulary critical water quality problems due to both point and non-point sources of pollution. Water quality limited segments in Subarea 0414 are the Oswego River, Fish Creek (Barge Canal), Crusoe Creek, Upper Seneca Lake, and the Seneca River.

A problem in Subarea 0415 is that hydroelectric power plant operations sometime restrict flow downstream from the plants at times when the flow is needed to maintain the dilution necessary to meet water quality standards. This is a problem in the upper Black River, the Oswegatchie River, and the Raquette River. In the St. Lawrence River there are some problems associated with toxic wastes from hard products industries, including mercury. In inland lakes throughout the Subarea, there is some pollution due to septic tank drainage of cottages which increases nutrient loads. Water quality limited segments

are the Black, St Lawrence, St. Regis, Salmon, Chateaugay, Raquette, Grosse, and Oswegatchie Rivers

HYDROELECTRIC POWER

There are numerous hydroelectric plants in the tributary streams of the St. Lawrence River in Subarea 0415. Over 80% of the present hydroelectric capacity of the Great Lakes Basin is found in the Lake Ontario basin, primarily in Subarea 0412 (Niagara River) and Subarea 0415. It has been estimated that over 5,700 MW of potential pumped storage capacity could be developed at sites in the Lake Ontario basin. An additional 627 MW of conventional hydropower is also undeveloped in the basin There is opportunity for the development of hydroelectric power in Subarea 0414, Southeastern Lake Ontario

COMMERCIAL AND SPORT FISHERY

Commercial fishing is of much less consequence than the sport fishery and is valued at less than $100,000 per year to the fishermen. There is a tremendous potential for salmonid production in Lake Ontario It is the primary objective of present management programmed for the lake. It is doubtful that commercial fishing will regain its prominent position in Lake Ontario unless other sources of food fishes collapse throughout the world Management of the open lake must be coordinated between Ontario and New York in order to be successful. The sport fishery is a major factor in economy of many communities, although there are no reliable figures available on the actual value of the sport fishery in the lake.

The other uses of Lake Ontario also have an effect on fish resources Of particular concern is the effect of thermal discharges, recreational boating and water skiing, construction dredging, spoil and filling operations, proposed year-round navigation, fluctuations of water levels for hydroelectric power operations, and use of tributary streams and upper lakes drainage for industrial and domestic waste disposal which is discharged into estuary and wetland areas. In addition to regulation of these activities, adequate salmonid stocking must be insured. Intensive management of fishing streams will require extensive funding for acquisition, development, and maintenance for public fishing rights Similar funding will be required for lake-oriented management to provide public access, fishing piers, artificial reefs, safety harbors, adequate work vessels for additional census research, and fish stock monitoring. Of equal or greater importance than State control in Lake Ontario is the need for international and interstate authority to control degrading practices throughout the Great Lakes Basin. Comprehensive planning with all water users on a local, State, and international basis will be required.

OUTDOOR RECREATION

Problems of providing outdoor recreation in the Lake Ontario basin are generally the same as in the other areas except that in most cases there is an inflow of people for recreation rather than an outflow towards other areas. The principal problem in the western part of the basin is an inadequacy of beach area. Most of the existing beach area is privately owned and both the privately and publicly owned areas are heavily polluted so that very little is available for use.

A critical obstacle in meeting recreational needs of Subarea 0413 is the lack of Lake Ontario beach acreage available to the public. Some of the prime land areas for industrial development in this area are along the shorelines and the stream valleys along the lower Genesee River Transportation routes also conflict with aesthetic and recreational land uses. The major problem in Subarea 0414 is the extensive private ownership of shorelines along the Finger Lakes, which makes public development of recreational facilities, particularly swimming facilities, difficult and expensive

In Subarea 0415, the present amount of water surface acreage appears to be adequate to meet the requirements of water-dependent activities until the year 2000. One of the major recreation problems in this area is the overuse of shoreland areas for recreation. This subarea receives heavy use from the Albany, Schnectady, and Utica areas, especially for weekend and vacation use

RECREATIONAL BOATING

An updated program concerning small boat harbors on Lake Ontario is essential to the expansion of recreational boating on these waters. In addition to more harbors on the lake, another urgent need is a better system to inform recreational boaters of weather conditions and forecasts On Lake Ontario, a desirable spacing for harbors of refuge should be 15-20 miles

Subarea 0413 experiences only a modest influx of nonresident boaters because of its limited quantity of water suitable for recreational boating. The lack of stream improvements, lack of maintenance, and periodic low flows limit the amount of canoeing and small boat opportunities on the inland streams in the area.

If recreational boating is to develop as projected, additional surface water and access sites must be provided

Subarea 0414 experiences a large influx of nonresident boaters because of its large quantities of water, particularly the Finger Lakes, suitable for recreational boating. Planning for the satisfaction of the boating-day needs involves berthing facilities and launching sites. One of the major problems related to recreational boating is that the facilities at inland lakes are inadequate, even though the surface area is available Access sites and marinas are needed. The lack of stream improvement and the inability to maintain low flows limit the use of small tributaries in the river basin group by canoes and small boats.

The recreational boating needs in Subarea 0415, the Northeastern Lake Ontario-St. Lawrence area, are small in relation to existing supply. The area provides quite good boating opportunities at the present time. In addition to planning for the satisfaction of the boating-day needs, it is also necessary to plan berthing facilities and launching sites. Many potential canoe and small boat streams in this area need improvement and maintenance. Low flows also contribute to the problems with providing opportunities for canoe and small boat experiences There is insufficient mooring along Lake Ontario.

The most significant priority for the ports of the Lake Ontario region is strong local port promotion to increase the general cargo traffic with Canada and overseas. Cargo handled at the ports in Subarea 0414 is not expected to exceed more than one million tons annually between now and 2000 Very little cargo is handled in the ports

of Subarea 0415. From the present time through 2000, Ogdensburg on the St. Lawrence River is expected to be the only significant harbor in Subarea 0415. Traffic will remain less than a million tons.

LAND TREATMENT AND DRAINAGE

Conservation practices could be effectively applied to 2.6 million acres in the Lake Ontario basin to reduce soil erosion and retain slant cover. Increasing pressure to convert agricultural lands to other uses is also a major problem. In many cases, these other land uses reduce the amount of cover on the land and increase the amount of sediment Control of erosion is needed, particularly in urban areas, if water quality is to be improved by reducing the amount of sediment About 14% of the total agricultural land in the Lake Ontario basin, or 1,656,000 acres, has a wetness problem. The large lakeplain areas in 0413 and 0414 have historically had poor drainage.

More than 5 6 million acres, or 50% of the Lake Ontario region, is covered by forests. Maintenance of forest cover is needed for watershed protection, continuing production of timber products, recreation, fish and wildlife habitat, aesthetics, and combinations of these values About 3.8 million acres could benefit from forest conservation treatment.

The greatest existing forest land problem is how to secure good management for private forest lands. The bulk of the privately-owned forest is owned by farmers or other individuals, with only about one-fifth of it being owned by the forest industry. On only 490,000 acres of the 2.2 million forested acres is treatment adequate. The single most important type of need in this area is for forest stand improvement, with reforestation and grazing control of moderate importance.

SHORELAND EROSION AND MANAGEMENT

The Lake Ontario shoreline has considerable mileage subject to noncritical erosion that are not protected and a somewhat lesser amount of shoreline subject to critical erosion and not protected In Subarea 0413, most of the shoreline subject to flooding is in Monroe County west of Rochester, while critical and noncritical shoreline erosion occurs mostly in Orleans and Niagara Counties. There are 88 6 miles of shoreline in Subarea 0414 subject to erosion. The lake bluff area just east of Sodus Bay has houses dangerously close to the top of the receding bluff. Of the total, 84.1 miles are subject to noncritical erosion, and 4.5 miles are subject to critical erosion. Only about 7% of the entire shoreline in the subarea is protected. There are no critical erosion problems in Subarea 0415 due to the natural resistance of the rocky shore and the lake level regulation plan which reduces peak lake levels.

STREAMBANK EROSION

Streambank erosion results in increased sedimentation in streams This prevents other uses of the water as a result of the degraded water quality. Streambank erosion results in some siltation of reservoirs in the Lake Ontario basin and increases the amount of harbor dredging for commercial navigation. Increased sediment resulting from urbanizing areas could become the major source of sediment in the streams as well as a serious pollution threat.

FLOOD DAMAGES

In Subarea 0413, the greatest flood damages occur in rural areas. Floods in the summer of 1972 in the Genesee River basin have reemphasized the flooding problem, especially the land loss resulting from floods in the upstream areas.

Although the Oswego River basin, Subarea 0414, has a total of 5,121 square miles, its principal flood problems occur at points where the tributary drainage area is 200 square miles or less. As of the present time, areas with average annual damages greater than $20,000 occur along the Seneca River from its confluence with Skaneateles Creek to its confluence with the Oneida River, along almost the entire shoreline of Oneida Lake, and along the entire length of the Oneida River. Most of the entire Barge Canal reach in the 0414 area, as well as most of the Finger Lakes shorelines and the streams connecting the Finger Lakes with the Barge Canal, are are expected to be subject to major flooding damages in the period between the present time and 2000

Flooding in the Black River basin affects primarily the flat lands between Lyons Falls and Carthage This is the only place in the subarea where major flood damages (estimated $133,000 annual average) occur. This land is used almost entirely for agricultural purposes with dairying the principal activity Major damages are expected to occur in the lower reaches of the Oswegatchie, Grass, Raquette, and Black River basins by 2000 unless flood plain management programs or other alternatives are effective in preventing these damages.

WILDLIFE MANAGEMENT

Urban encroachment on wildlife habitat is the most important wildlife problem in the lowlands Conversion of agricultural land to residential or industrial uses not only permanently destroys habitat, but also effectively restricts wildlife management and the use of surrounding lands. A broad urban belt disects Subarea 0414 from east to west, and expansion of the zone is eliminating wildlife habitat. However, idle farmland is more common in the vicinity of urban areas, and due to its high quality as wildlife habitat, the increases in this acreage partially compensate for habitat losses. In Subarea 0415, there is a need to introduce new wildlife species Some zones have stable land use patterns but lack wildlife species adapted to such use.

AESTHETIC AND CULTURAL RESOURCES

Major problems in preserving aesthetic and cultural values in Subarea 0413 are competition between industrial or residential use or shoreline and preservation of aesthetic values, inadequate funding for land acquisition, and the need to preserve outstanding values.

Along the shoreline of Lake Ontario in Subarea 0414, there is a critical need for planning and detailed study of the existing and potential future environmental systems. A system of buffer and linkage pattern corridors stretches along the shoreline from Niagara Falls to Syracuse and Utica and then northward to Watertown. These corridors warrant planning attention and detailed study to insure the future availability and proper use of the resource features. Emphasis must also be given to the resource clusters and scattered single resource features, since these serve as the attractions for recreationists visiting the area. A lack of consideration for their future and for their proper

use could result in their degradation and loss. One of the more difficult planning problems in the area is what land uses to set aside for future recreational and aesthetic and cultural use. The land adjacent to the Barge Canal, the Finger Lakes, and the streams connecting them form a highly valuable aesthetic and cultural network of linkage corridors. Some conflicts exist between the use for recreation and the maintenance of aesthetic and cultural values and uses for other purposes.

There is a need to preserve the existing aesthetic and cultural values in Subarea 0415. Much of the land in this area is in private ownership, and regulations are needed in order to insure that if such ownership continues, private development will not take place which will detract from the overall attractiveness of the area. There are numerous clusters of single and multiple aesthetic and cultural values. If these are to be preserved, there will probably need to be a considerable increase in the funds spent for land acquisition in this area for aesthetic and cultural values.

NON-VOLUMETRIC REQUIREMENTS[1]

REGION. Great Lakes (04)	ASA No. 08	AREA (in acres x 1000) 11,120 0		
STATES. NY	COUNTIES. New York (20)			
Resource Use Categories	Units	Base Year (1970) Supply	Needs[2]--Base Year (1970) to- 1980	2000
W.O. Outdoor Recreation[3]	1000 rec. days	12,700	8,960(10,100)	16,793(21,200)
Sport Fishing[3]	1000 angl days	11,800	4,492(5,350)	6,905(9,700)
Recreational Boating[3]	1000 boat days	4,030	403(636)	529(1,210)
	1000 acres W.S [4]	750	750	750
Wildlife Management[3]	1000 acres		78	544
	1000 user days	2,110	361(491)	581(983)
Resource Use Categories	Units	Opportunities for Treatment or Damage Reduction for the Year[5]		
		1970	1980	2000
Agr. Land--Treatment	1000 acres	2,600	2,600	2,600
Forestland--Treatment	1000 acres	3,840	3,840	3,840
Shoreland Erosion[6]	miles	186	186	186
Streambank Erosion	miles	1,510	1,510	1,510
	$1000 AAD[8]	326	326	326
Resource Use Categories	Units	Projected Flood Damages and Cropland Drainage for the Year[7]		
		1975	1985	2000
Flood Plains --Urban	$1000 AAD[8]	2,000	2,443	2,604
--Rural	$1000 AAD[8]	1,965	2,182	4,756
Cropland Drainage	1000 acres	---	0	382

1 From Great Lakes Basin Framework Study, Appendix 1, Normal Growth, and the Assessment Modified Central Case
2 Additional resource requirements beyond 1970 requirements
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4. Opportunities
5 All figures are from the Framework Study
6 The Corps of Engineers is currently conducting a shoreline damage survey for the recent period of high Great Lakes water levels (1972-1974)
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PUBLIC REVIEW GROUP RESPONSES TO MARCH, 1976 DRAFT
STATE REGIONAL FUTURE REPORT

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